Final
Environmental Assessment

13th Street Bridge
Emergency Repair and Retrofit

Vandenberg Air Force Base
California

23 June 2003

Report Documentation Page

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FINDING OF NO SIGNIFICANT IMPACT AND FINDING OF NO PRACTICABLE ALTERNATIVE

Emergency Repair and Retrofit of the 13th Street Bridge at Vandenberg Air Force Base, California

Pursuant to provisions of the National Environmental Policy Act (NEPA), 42 U.S. Code 4321 *et seq*, implementing Council on Environmental Quality (CEQ) Regulations, 40 Code of Federal Regulations (CFR) 1500-1508, Air Force Instruction (AFI) 32-7061, entitled *Environmental Impact Analysis Process*, as amended by the interim change dated March 12, 2003, which adopted 32 CFR Part 989, the Air Force conducted an assessment of the potential environmental consequences of an emergency repair, temporary shoring, and retrofit of the 13th Street Bridge over the Santa Ynez River on Vandenberg Air Force Base (AFB), California.

Vandenberg AFB is headquarters to the 30th Space Wing, the Air Force Space Command unit that operates Vandenberg AFB and the Western Range. Vandenberg AFB operates as a missile test base and aerospace center, supporting west coast space launch activities for the Air Force, Department of Defense, National Aeronautics and Space Administration (NASA), and commercial contractors.

Vandenberg AFB is located on the south-central coast of California, approximately halfway between San Diego and San Francisco. The 99,492-acre base extends along approximately 35 miles of Santa Barbara County coast and varies in width from 5 to 15 miles. The Santa Ynez River divides north and south Vandenberg AFB, along the four miles of the river that run through the base. A bridge spans over the Santa Ynez River on 13th Street (13th Street Bridge), providing the only on base transit route and vehicle link between North and South Vandenberg AFB. The 13th Street Bridge is critical for the transport of equipment between North and South Vandenberg AFB, and the operation of utilities on South Vandenberg AFB, in support of several Vandenberg programs.

The 30th Space Wing Civil Engineering Squadron (30th CES) has identified the need to perform repairs and a retrofit of the 13th Street Bridge over the Santa Ynez River on Vandenberg AFB, California. These actions will ensure the continuation of vital utility services and mission essential transportation capability.

The Environmental Assessment (EA) (incorporated as an attachment to this finding) considered all potential impacts of the proposed action and alternatives, both as a solitary action and potentially in conjunction with other similar projects. The EA summarizes the results of the evaluations of the proposed action and alternatives. It analyzes activities that have the potential to affect both the natural and human environment. This analysis summarizes the options evaluated and provides information explaining the need for the proposed action and its effect on human and natural resources.

PROPOSED ACTION

a. The proposed action includes the already completed short-term emergency action that protects the northerly bridge abutment and piers, the temporary shoring project to ensure the safe transportation of heavy mission essential payloads across the bridge, and the proposed retrofit of the bridge structure and stabilization of the northern riverbank to ensure the usability of the bridge until a full bridge replacement is possible.

   To accomplish the emergency repair, Vandenberg AFB requested a waiver from the normal Environmental Impact Analysis Process, in accordance with 32 CFR §989.36. This was requested due to impending 2002-2003 winter storms, which could result in additional erosion and scouring around the bridge piers and abutment. The Deputy Assistant Secretary of the Air Force (Environment, Safety, and Occupational Health) granted this waiver on 20 December 2002. The emergency repair, completed in December 2002-January 2003, involved the short-term reinforcement of the bridge to prevent its collapse.

   To install the temporary shoring, Vandenberg AFB requested a waiver from the normal Environmental Impact Analysis Process, in accordance with 32 CFR §989.36. This was requested to ensure the safe transportation of heavy mission essential payloads across the bridge. The Deputy Assistant Secretary of the Air Force (Environment, Safety, and Occupational Health) granted this waiver on 1 April 2003. The temporary shoring project was initiated on 14 April 2003. Mission program changes at Vandenberg AFB resulted in this project being put on hold on 25 April 2003. All construction activities ceased on that date.

   The proposed retrofit will entail the installation of retrofit components to protect the bridge substructure (piers and pile caps) and superstructure (T-beams), and the protection and stabilization of the northerly abutment with rock riprap and of the northerly riverbank with a pile retard system. This phase will be completed over a five-month period beginning in the summer of 2003.

b. Alternatives: The other three possible alternatives considered are as follows. The first involves a fast-track bridge replacement. However, given the physical deficiencies of the bridge and the expected winter 2002-2003 storms, there is high risk of loss of the bridge prior to completing a design and securing necessary permits. The second consists of providing additional supports to the existing bridge structure at the middle of each span (distance between support structures). Lastly, the third is installing approximately 1,000 feet of rubber tires to protect the riverbank. None of these alternatives adequately met selection criteria as put forth in Chapter 1 of the attached EA.

With no practicable alternative to the proposed action as described above in (a), the evaluation of the Proposed Action was limited to a comparison with the No Action Alternative. The No Action Alternative is unacceptable, because the 13th Street Bridge is a mission-critical transportation link that is at risk of failure and lacks the necessary capacity to ensure safe transport of heavy loads. Not completing the emergency repair and retrofit of the bridge will adversely impact mission accomplishment.

SUMMARY OF FINDINGS

a. Biological Resources

(1) ***Native Habitats and Special Status Plant Species.*** The Proposed Action will directly affect Southern Willow Scrub, Freshwater Marsh, and Central Coast Scrub. All construction constraints and monitoring measures described in the EA under the Proposed Action (Chapter 2) will be implemented to minimize disturbances and adverse impacts to native habitats. Any impacts on wetlands will be mitigated through restoration of riparian wetlands and creation of vegetated buffers as described in the Habitat Restoration Plan (Appendix D of the EA). No special-status plant species were found within the project area during the botanical surveys.

(2) ***Special Status Wildlife Species.*** Potential adverse impacts to special status species include temporary loss of habitat, disturbance due to noise, entrapment in project area, temporary decrease of habitat quality, abandonment of breeding site, and abandonment of roosting site. All construction constraints and monitoring measures described in the EA under the Proposed Action (Chapter 2) will be implemented to minimize and where possible eliminate these potential adverse impacts. Vandenberg AFB and the contractor will adhere to all terms and conditions resulting from the Section 7 consultations under the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*), with the U.S. Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration Fisheries Service (NOAA Fisheries).

Vandenberg AFB received the Biological Opinion (BO) from the USFWS on July 25, 2003, and the BO from NOAA Fisheries on July 31, 2003. These regulatory consultations resulted in modifications to four of the measures identified in the EA, and also added additional measures that will be implemented to comply with the Terms and Conditions of these Biological Opinions.

Measures in the EA that have been modified as a result of regulatory consultations are as follows:

- A screen with a mesh size of five millimeters will be attached to the end of the hose of dewatering pumps to prevent entrapment of southern steelhead, tidewater gobies, and California red-legged frogs or tadpoles within the pump system. [Modifies Section 2.2.5.1, measure 15].

- Surveys will be performed each day, prior to the start of construction, by a Service-approved biologist and follow survey guidelines established for the species or as directed by the Service. All tidewater gobies and California red-legged frogs should be moved to the nearest suitable habitat out of harm's way. The size, age-class, location of capture, and the relocation site should be determined and recorded for each relocated California red-legged frog. [Modifies Section 2.2.5.1, measure 31]

- An extra siltation curtain will be placed next to, and at least one foot away from all existing ones. All existing siltation curtains will be checked to make sure they are functional, and replaced if necessary. All siltation curtains shall be in place during construction activities to minimize sediment and sediment/water slurry input into flowing water. [Modifies Section 2.2.5.2, measure 14].

- If dewatering of the work area with a pump is necessary, the water will be removed to an upland disposal site to ensure that sediment or slurry in the pumped water does not impact water quality in the Santa Ynez River. [Modifies Section 2.2.5.2, measure 13].

Additional measures resulting from regulatory consultations that will be implemented are as follows:

- To allow adult steelhead to migrate, a flowing section of the Santa Ynez River between at least two bridge piers shall be restored no later than 16 January 2004.

- Wildlife within the action area will not be fed.

- To the extent practicable, bullfrogs, exotic crayfish and introduced fish species observed during project construction will be permanently removed from the action area in compliance with California Fish and Game Code.

- A USFWS-approved biologist will participate in establishing the boundaries of the construction area.

- During translocation, handling time of individuals of tidewater gobies and California red-legged frogs must be kept to the shortest duration practicable.

- The Air Force will submit the names and credential of biologists proposed to survey for listed species, and to capture and relocate tidewater gobies and California red-legged frogs, to the USFWS for their review and approval. No individual will participate in these activities without the approval of the Service.

- As part of the revegetation plan, the lower portion of the riprap bank stabilization will be filled with soil and revegetated with live willow stakes to accelerate recovery of the riparian cover next to the active channel.

b. Water Resources

Potential adverse effects from the Proposed Action to water resources include alteration of floodplain limits and hydraulic capacity of the river, contamination of groundwater from fuels and other hazardous fluids associated with construction equipment, and increased sedimentation load. All construction constraints and monitoring measures described in the EA under the Proposed Action (Chapter 2) will be implemented to prevent these potential adverse impacts. Vandenberg AFB and the contractor will adhere to all terms and conditions

set forth in the U.S. Army Corps of Engineers Section 404 permits and Central Coast Regional Water Quality Control Board 401 certifications.

c. Air Quality

An Air Conformity Analysis completed under 40 CFR 93.153(b), (c), and section 176(c)(4) of the Clean Air Act, deemed the Proposed Action *de minimis* and exempt from further conformity requirements. No permits are required for implementation of the proposed project. All construction constraints and monitoring measures described in the EA under the Proposed Action (Chapter 2) will be implemented to further decrease emissions during construction.

d. Cultural Resources

There are no documented historic or archaeological resources within the proposed project site. Therefore, no archaeological studies in accordance with Section 106 of the NHPA are required. No adverse impacts to known cultural resources are anticipated with the Proposed Action. The State Historic Preservation Officer will be notified, in accordance with 36 CFR 800.4(d), of the methods used by Vandenberg AFB to determine that no cultural properties exist within or near the APE, prior to initiation to the proposed retrofit.

e. Noise

Because noise levels generated by construction activities associated with the Proposed Action would be a temporary short-term occurrence, no adverse impacts from noise are anticipated to occur.

f. Earth Resources

No adverse impacts are anticipated to earth resources from implementation of the Proposed Action.

g. Land Use

No adverse impacts on land use are anticipated from implementation of the Proposed Action. In accordance with the Coastal Zone Management Act (CZMA), Vandenberg AFB will submit a Negative Determination to the California Coastal Commission (CCC) and request concurrence prior to initiation of the proposed retrofit.

h. Human Health and Safety

With regulatory compliance, the Proposed Action would have no impacts on health and safety.

i. Hazardous Materials and Hazardous Waste

Compliance with 30th Space Wing Plan 32-7086, *Hazardous Materials Management*, for the proper containment, storage and disposal of hazardous wastes generated by construction activities associated with the Proposed Action, will prevent potential adverse effects.

j. Solid Waste

The Proposed Action would have no impacts on solid waste management at Vandenberg AFB.

k. Pollution Prevention

Compliance with the Vandenberg AFB Pollution Prevention Management Plan (PPMP) and implementation of the recommended measures for air quality, hazardous waste management, and solid waste management will result in no impacts from implementation of the Proposed Action.

l. Socioeconomics

No impacts are anticipated to the socioeconomics of the region from implementation of the Proposed Action.

m. Environmental Justice

Implementation of the Proposed Action will not result in impacts to minority communities and low-income communities.

n. Cumulative Impacts

A full replacement of the 13th Street Bridge over the Santa Ynez River may occur within the next five years. However, no funding for the project has been authorized or appropriated. In addition, no plans have been developed for the bridge and no decision has been made regarding the potential location of the bridge. As a result, the potential impacts of the future bridge cannot be assessed. If construction of a new bridge is authorized, the project will undergo appropriate environmental analysis.

PRACTICABLE ALTERNATIVES

There is no practicable alternative to the Proposed Action. As described in Chapter 2 of the attached EA all other possible alternatives would fail to meet selection criteria.

FINDING OF NO SIGNIFICANT IMPACT

Based upon my review of the facts and analyses contained in the attached EA conducted in accordance with the provisions of NEPA, the CEQ Regulations, and AFI 32-7061 as amended by the interim change dated March 12, 2003, which adopted 32 CFR Part 989, I conclude that the Proposed Action will not have a significant environmental impact, either by itself, or cumulatively with other ongoing projects at Vandenberg AFB. Accordingly, an Environmental Impact Statement is not required. The signing of this combined Finding of No Significant

Impact and Finding of No Practicable Alternative (FONSI/FONPA) completes the environmental impact process.

FINDING OF NO PRACTICABLE ALTERNATIVE

Pursuant to Executive Order 11990 and 32 CFR 989.14(g), the authority delegated in SAFO 791.1 and taking the information contained in the attached environmental assessment into consideration, I find that there is no practicable alternative to constructing the Proposed Action in a floodplain. The Proposed Action, as designed, includes all practicable measures to minimize harm. Before undertaking this action, Vandenberg AFB officials will complete all relevant regulatory processes, and subsequently abide by all permit conditions and mitigations.

APPROVED BY

LANCE W. LORD
General, USAF
Commander, AFSPC

Final
Environmental Assessment

13th Street Bridge
Emergency Repair and Retrofit

Vandenberg Air Force Base
California

Submitted To:

Department of the Air Force
30th Space Wing
Environmental Flight
Vandenberg Air Force Base, California

23 June 2003

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Chapter 1. Purpose of and Need for Action

1.1 Purpose

The Air Force proposes to stabilize and retrofit the 13th Street Bridge over the Santa Ynez River on Vandenberg Air Force Base (Vandenberg AFB) California. Actions will also be taken to protect the northern bank at the bridge abutments. This purpose of these actions are to ensure safe year-round long-term transportation and communication capabilities between North and South Vandenberg AFB.

Vandenberg AFB is headquarters for the 30th Space Wing. The Air Force's primary missions at Vandenberg AFB are to launch and track satellites in space, to test and evaluate America's intercontinental ballistic missile systems, and support aircraft operations in the Western Range. As a non-military facet of operations, Vandenberg AFB is also committed to promoting commercial space launch ventures.

1.1.1 Project Location

Vandenberg AFB is located on the south-central coast of California, approximately halfway between San Diego and San Francisco. The base covers 99,492 acres in western Santa Barbara County and occurs in a transitional ecological region that includes the northern and southern distributional limits for many plant and animal species.

The Santa Ynez River divides north and south Vandenberg AFB, along the four miles of the river that run through Vandenberg AFB. The river is contained in the Lompoc Valley, which comprises the Santa Ynez River floodplain. The Santa Ynez River is the largest drainage basin of any stream on Vandenberg AFB. The Santa Ynez River is 70 miles long and drains approximately 900 square miles.

The proposed project site is located approximately three miles inland from the Pacific Ocean. The bridge is on 13th Street, approximately three miles south of New Mexico Avenue and one-half mile northeast of the access gate to south Vandenberg AFB at Ocean Avenue. Figure 1-1 illustrates the regional location of the proposed 13th Street Bridge repair project. Figure 1-2 is a local vicinity map, showing the surrounding roads.

1.2 Need

The 13th Street Bridge provides access over the Santa Ynez River. The Los Angeles District of the U.S. Army Corps of Engineers (ACOE) designed the bridge in 1968. Construction was completed in March 1970.

The 13th Street Bridge is the only on-base transport route and vehicle link between North and South Vandenberg AFB, and is critical to the support of several Vandenberg AFB programs. The bridge also supports utilities including essential communication lines between North and South Vandenberg AFB. Inspections of the 13th Street Bridge since April 2001 have revealed the vulnerability of the bridge due to scouring and instability of the foundation. Both of these conditions have rendered the bridge inadequate to support vehicle loads over 10 tons, and represent a risk to the stability of the bridge.

The information and descriptions that follow were excerpted from the *Repair 13th Street Bridge Study* dated June 26, 2002 (Penfield & Smith & Bengal 2002), and the *Pre-Final 85% Submittal Repair 13th Street Bridge* dated January 31, 2003 (Penfield & Smith & Bengal 2003).

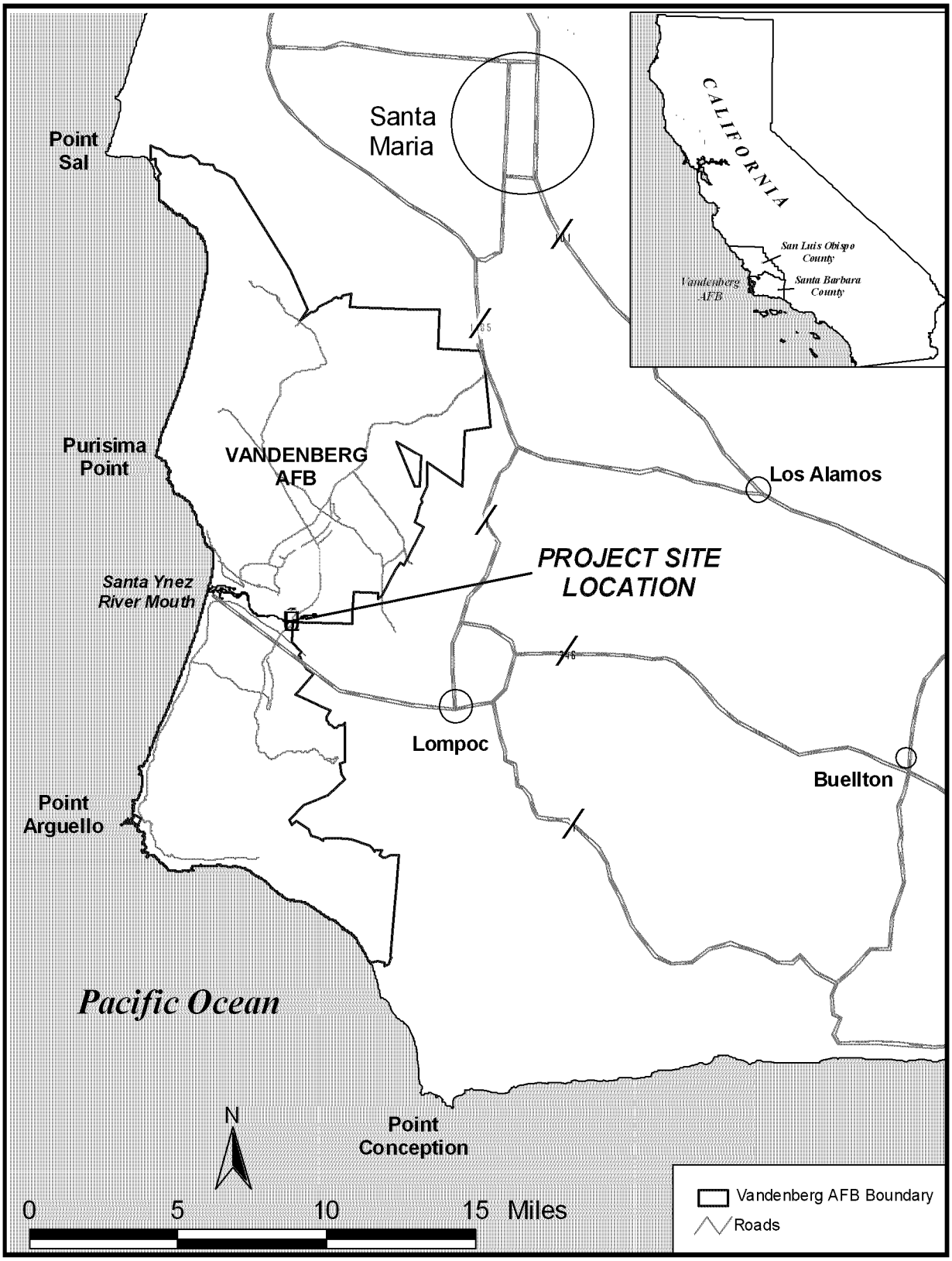

Figure 1-1. Regional location of Vandenberg AFB and the 13th Street Bridge.

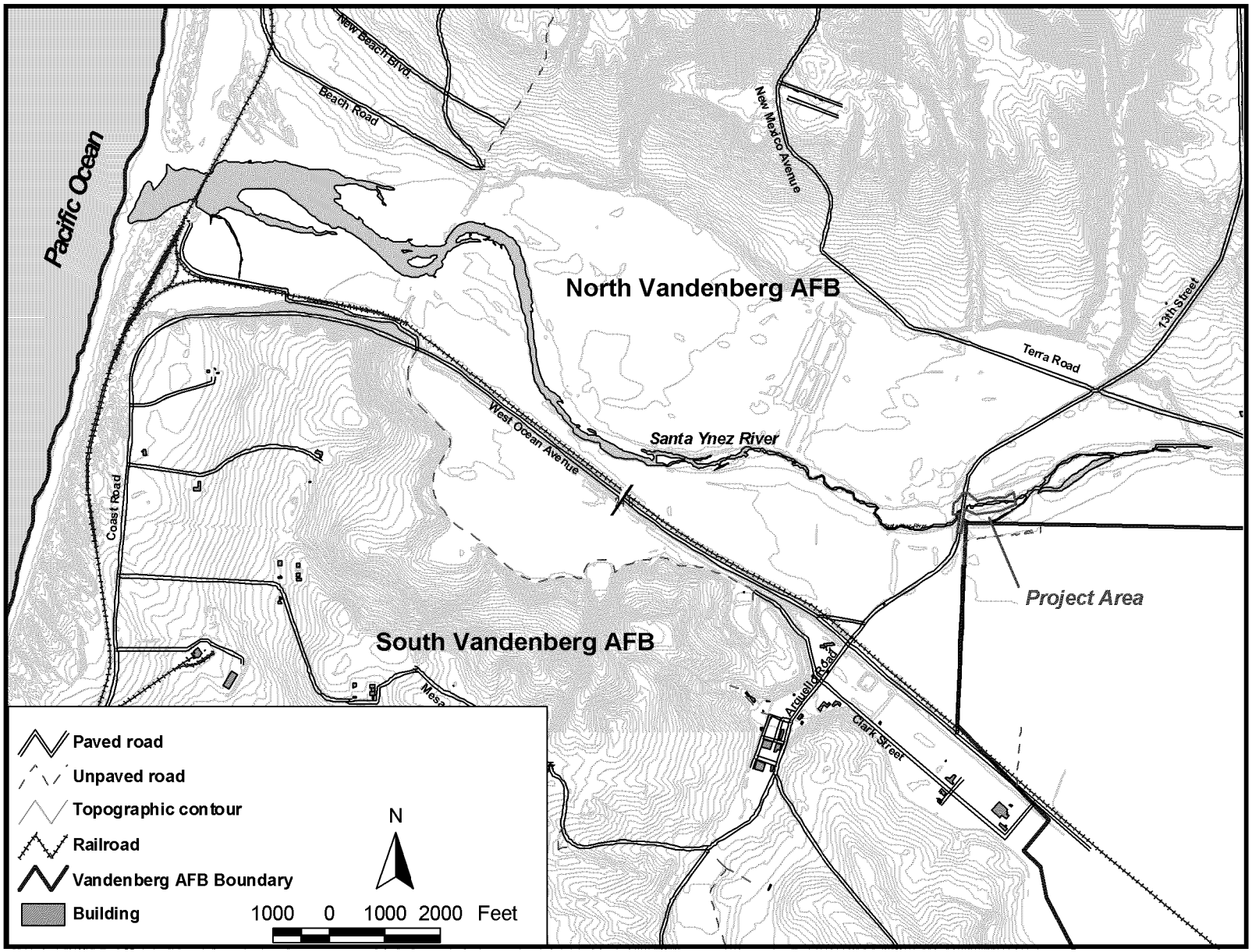

Figure 1-2. 13th Street Bridge project area and vicinity.

1.2.1 Bridge Conditions

The 13th Street Bridge is a two-lane reinforced concrete, T-girder structure that is 500-feet-long with eight piers and two abutments. Each of the piers is supported by a single row of 60-foot steel piles. The bridge has been modified several times and was retrofitted in 1981.

An evaluation of the scour and bank erosion of the Santa Ynez River at the 13th Street Bridge completed by Penfield & Smith & Bengal Engineering (2002) rated the bridge as scour critical. Scour is the erosive action of flowing water, excavating and carrying away material from the bed and banks of streams and rivers. At the 13th Street Bridge, the Santa Ynez River has degraded approximately 10 feet since original bridge construction in 1970. In addition, the bridge piers and abutments are subjected to pier scour, abutment scour and contraction scour, all of which occur as part of a cyclic process during flood events. Water from the north bank deflects on to the northern bridge piers nearly perpendicular to the river channel, contributing to additional scour at the piers and abutment. Exposed steel piles at the riverbed are subject to continuous abrasion from the flowing water. The continuous exposure to salty air and water has accelerated the corrosion rate of the bare steel piles.

The substructure of the bridge is non-conventional in that it has a single row of piles at the piers and abutments. The piles are 59 feet in length. Because of the poor subsoil in the riverbed, fixity of the pile is not achievable within the top 20 to 30 feet. The local scouring that occurs around the piles has pushed the fixity levels down even further. Concrete added to the pier pile cap during a past retrofit improvement has increased the dead load without lateral support, further driving down on the inadequately supported piles.

1.2.2 River Conditions

The Santa Ynez River at the 13th Street Bridge is an alluvial fan setting in a wide floodplain with little or no natural levees. The river is incised to a depth of between four and 12 feet, with alluvial channel boundaries and moderate tree cover on the riverbanks. The flowing stream is sinuous, locally and generally braided with significant wide point sandbars, including a sandbar running through the bridge.

Four of the factors that indicate scour as a consistent issue and potential on-going problem are stream size, river setting, tree cover on banks, and river channel pattern.

Stream Size: Scour at piers, abutments and banks increases with stream size. The Santa Ynez River is considered a significant river of medium size (USFS 2002).

River Setting: The absence of valley, alluvial fan, natural levee, and alluvial channel boundaries, allows for significant bank scour or erosion. Approximately 90% of all channel changes in alluvial channels occur during flows greater than the dominant discharge, which typically occurs less than 10% of the time.

Tree Cover on Banks: The low tree cover on the banks is a natural result of a meandering, braided river. The flow of the river moves routinely and limits old growth along the banks by constantly uprooting trees.

River Channel Pattern: The tendency of the river to flow in a braided pattern and develop significant sandbars has the potential to cause high erosion in the banks. The present stream of the Santa Ynez River at the 13th Street Bridge makes a sharp turn at the northerly abutment and flows perpendicular to the northerly piers before making another sharp right turn to flow between the piers.

1.2.3 Bridge Effects on Stability of the Santa Ynez River

The riverbed near the 13th Street Bridge has degraded progressively since original construction of the bridge. Degrading means the lowest point of the riverbed is deteriorating to an increasingly lower elevation. This degradation is expected to continue over time. Evidence of this condition can be seen in the exposed H-piles. The 13th Street Bridge is supported on friction piles driven into the soils, which are mostly alluvial, i.e. loose granular soils. It is estimated that the riverbed has degraded approximately 10 feet near the northerly piers and abutment since bridge construction.

There is some visual evidence that the existing bridge is causing some high flow constrictions that have exacerbated the stability problems in the river. The floodplain over-banks extend outside the length of the bridge span. During high flows when the water is at flood-stage levels, the bridge may create a backwater effect (Figure 1-3), which can cause increased upstream and downstream bank erosion. Aerial photography of the site shows increased bank erosion and diminished willow protection at these eroded banks immediately upstream and downstream of the bridge, contrasting markedly with the behavior of the river upstream and downstream, beyond the effects of the bridge. Bank erosion on the upstream side of the bridge is more pronounced than on the downstream side due to the curve of the river.

1.2.4 Bridge Deficiencies

At the present time, the 13th Street Bridge suffers several deficiencies. As a result of the interruption of the compaction or density of the soils due to the degradation of the riverbed combined with scour, the friction piles no longer function as efficiently to support the bridge in either a vertical or a horizontal direction. In addition, with piers suspended in the air, there is little lateral soil support resisting lateral movement of the piers.

The geomorphic characteristics of the river (braided stream) through the bridge at its north abutment, aggravates the local scour. Falling vegetation and the relatively fresh vertical faces on the banks, accompanied by the widening sandbar at the bridge, are indicative that the problem is at the apex of its effects on the north abutment.

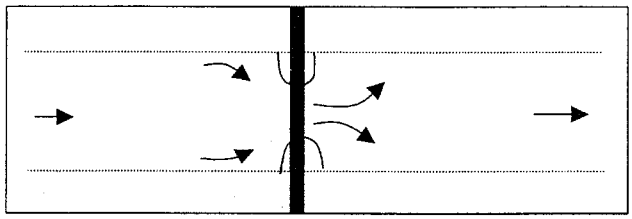

Figure 1-3. Illustration of backwater effect due to high flow constrictions.

A structural analysis of the bridge was performed by using computer modeling and finite element analysis techniques. A loading analysis of the structure was performed. Dead load is the vertical loading the bridge supports, i.e., the concrete deck, beams and supports. Live load is the weight of vehicles and pedestrians. This loading analysis concluded that the dead load of the structure upon the piles already exceeds estimated ultimate soil-bearing capacity of the piles. Since the bridge is still standing, it is assumed that there must be some excess capacity that goes beyond the theoretical calculations and may be a result of it using all of the available safety factors. The structural analysis indicates that the bridge, under its present deteriorating conditions, is not capable of supporting two 20-ton vehicles in each or the same direction. Further analysis and modeling revealed that the bridge piles are slightly overstressed when supporting two 10-ton vehicles. Both of these situations assume no river flow and no soil-bearing failure. The analysis also concluded that during a seismic event, the forces exerted on the piles and

foundation of the bridge could result in overstressing or even failure; and that this bridge should be considered as highly susceptible to damage for even the smallest of storm events

Structural deficiencies of the 13th Street Bridge can be summarized as follows:

1) The structure is overstressed when normal and legal vehicular loading is applied.

2) The structure is vulnerable to flooding events and seismic events.

3) The steel piles are exposed to a corrosive environment and subjected to abrasion from flowing water and sediment.

4) The north bridge abutment is subjected to bank erosion, becoming more severe with time.

5) Water deflected from the northeast riverbank impinges on the northerly three piers at an angle that results in increased local scours at the base of the piers. This impinging flow is partially responsible for the deepened channel at this location.

6) Exposure to a two-year storm event overstresses the piles due to the structural weight of the bridge. This type of storm event adds to the lateral load and scours the support around the support piles.

7) The pile to pile cap connection is weak.

8) The pile cap to pier wall connection is deficient.

9) The structure does not meet current seismic design criteria.

10) The pier support piles have a relatively low lateral resistance due to the high slenderness ratio of the piles and the low shear resistance of the soil.

11) The bridge girders are under-reinforced.

Should the structure and foundation of the 13th Street Bridge fail to support the bridge's dead load and live load, a collapse could occur. Should this occur during a flood, the course of the river could be redirected from the present alignment causing severe flooding, bank erosion, or environmental and property damage. A collapse of this bridge would sever communication lines and halt transportation between North and South Vandenberg, resulting in a severe detrimental impact on Vandenberg's mission.

1.3 Selection Criteria

Selection Criteria for the 13th Street Bridge were determined based on the Vandenberg AFB mission needs. These selection criteria are outlined below.

(1) Access between North and South Vandenberg AFB will not be interrupted for an extended period of time – as would be the case in the event of a collapse of the bridge structure.

(2) Mission-critical heavy payloads can be safely transported across the bridge.

(3) Communication lines and utilities currently supported by the bridge remain uninterrupted.

The Penfield & Smith & Bengal study, along with additional site inspections, and Project Validation Sheet, indicate that the 13th Street Bridge is in need of replacement. However, due to the long lead-time on funding and environmental permit process, it is necessary to implement interim support measures on the 13th Street Bridge to prevent its collapse.

Alternatives evaluated that would meet the above selection criteria use an El Niño type event, such as the one that occurred in 1998, as

the model storm for assessing effectiveness of various designs in meeting requirements. On February 24, 1998, the Santa Ynez River, near the location of the bridge, experienced a peak flow of 39,300 cubic feet per second (cfs). This equates to a 15-year event. The designs evaluated were based on the projected forces, velocity, scour, water level and flow duration of a 15-year storm event.

1.4 Major Issues

Stabilization and retrofit of the 13th Street Bridge will affect biological resources as a result of habitat disturbance and loss, and disturbance and other potential take of listed species. In addition, because the majority of the work will be accomplished from within the riverbed, and excavation and dewatering in specific areas will be required, turbidity, erosion and sedimentation may result from these activities. Lastly, because this retrofit is an interim measure until funds are secured for a full bridge replacement (within the next five years), there are foreseeable future disturbances to biological resources and water quality, and the potential for disturbances to cultural resources.

1.5 Scope of the Environmental Assessment

The National Environmental Policy Act (NEPA) and the Council on Environmental Quality (CEQ) regulations require a lead agency to prepare an Environmental Assessment (EA) to evaluate the potential impacts of federal actions on the surrounding environment. The U.S. Air Force is the lead agency for NEPA compliance on this project.

This EA has been prepared in accordance with the NEPA of 1969, as amended (42 U.S. Code [USC] 4321 *et seq.*), as implemented by CEQ Regulations (40 Code of Federal Regulations [CFR] 1500-1508); and Air Force Instruction (AFI) 32-7061, *Environmental Impact Analysis Process*, as amended by the interim change dated March 12, 2003, which adopted 32 CFR Part 989. This EA also provides the decision-maker and the public, information required to understand the potential environmental consequences of the alternatives evaluated.

Consistent with AFI 32-7061 and CEQ regulations, the scope of analysis presented in this EA is defined by the potential range of environmental impacts resulting from the implementation of the Proposed Action and Alternatives, including the No-Action Alternative. Resources potentially impacted are considered in more detail in order to provide sufficient evidence and analysis to determine whether or not additional analysis is required pursuant to 40 CFR Part 1501.4(c).

1.6 Applicable Regulatory Requirements

Federal and state laws affecting implementation of the Proposed Action and Alternatives are presented in Table 1-1.

Table 1-1. Federal and State laws applicable to the implementation of the Proposed Action.

FEDERAL LAW	ACTIVITY OR REQUIREMENT
National Environmental Policy Act (NEPA) of 1969 as amended (42 U.S. Code [USC] 4321-4347)	Requires federal agencies to analyze the potential environmental impacts of major federal actions and alternatives and to use these analyses as a decision-making tool on whether and how to proceed.
Clean Air Act (CAA) of 1970 (42 USC 7401 et seq.)	States that applicable state and national ambient air quality standards must be maintained during the operation of any emission source. National Ambient Air Quality Standards include primary and secondary standards for various pollutants. The primary standards are mandated by the CAA to protect public health, while the secondary standards are intended to protect the public welfare from adverse impacts of pollution, such as visibility impairment.
Clean Air Act Amendments of 1990	Establish new federal nonattainment classifications, new emissions control requirements, and new compliance dates for areas in nonattainment. The requirements and compliance dates are based on the nonattainment classification.
Clean Water Act (CWA) of 1977 as amended (33 USC 1251 et seq.)	Prohibits the discharge of pollutants from a point source into navigable Waters of the United States, except in compliance with a National Pollutant Discharge Elimination System (NPDES) (40 CFR Part 122) permit. The navigable Waters of the United States are considered to encompass any body of water whose use, degradation, or destruction will affect interstate or foreign commerce. Section 401 of the Clean Water Act (CWA) requires that the discharge of dredged or fill material into water of the United States does not violate state water quality standards. Generally, no CWA Sec. 404 permits will be issued until the State has been notified and the applicant has obtained a certification of state water quality standards. Section 404 of the Clean Water Act establishes a program to regulate the discharge of dredged and fill material into waters of the United States, including wetlands. Activities in waters of the United States that are regulated under this program include fills for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports), and conversion of wetlands to uplands for farming and forestry.
National Historic Preservation Act (NHPA) of 1966 as amended (16 USC 470 et seq.)	The NHPA is the key federal law establishing the foundation and framework for historic preservation in the United States. The Act authorizes the Secretary of the Interior to expand and maintain a National Register of Historic Places (National Register); it establishes and Advisory Council on Historic Preservation (Council) as an independent federal entity; it requires federal agencies to take into account the effects of their undertakings on historic properties, and to afford the Council an opportunity to comment upon any undertaking that may affect properties listed, or eligible for listing, in the National Register; and it makes the heads of all federal agencies responsible for the preservation of historic properties owned or controlled by them.
Archaeological and Historic Preservation Act (AHPA) of 1974 (16 USC 469a et seq.)	The AHPA is directed toward the preservation of historic and archaeological data that would otherwise be lost as a result of federal construction or other federally licensed or assisted activities. The AHPA authorizes the Department of the Interior to undertake recovery, protection, and preservation of archaeological or historic data.
Endangered Species Act (ESA) of 1973 (7 USC 136; 16 USC 460 et seq.)	Declares the intention of Congress to conserve threatened and endangered species and the ecosystems on which those species depend. The ESA requires that federal agencies, in consultation with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service, use their authorities in furtherance of its purposes by carrying out programs for the conservation of endangered or threatened species.

Table 1-1. Federal and State laws applicable to the implementation of the Proposed Action.

FEDERAL LAW	ACTIVITY OR REQUIREMENT
Section 7 of the ESA (16 USC 1536)	Contains provisions that require federal agencies to consult with the Secretary of Interior and to take necessary actions to insure that actions authorized, funded, or carried out by them do not jeopardize the continued existence of endangered species and threatened species.
Coastal Zone Management Act (CZMA) of 1972 (16 USC 2452-24645).	The CZMA plays a significant role in water quality management. Under the CZMA, a Federal action that may affect the coastal zone must be carried out in a manner that is consistent with state coastal zone management programs.
Migratory Bird Treaty Act (MBTA) of 1918 as amended (16 USC 703-712)	The MBTA implements various treaties and conventions between the U.S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Under the Act, taking, killing or possessing migratory birds is unlawful.
STATE LAW	**ACTIVITY OR REQUIREMENT**
Clean Air Act of 1988	This Act develops and implements a program to attain the California Ambient Air Quality Standards for ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter less than or equal to 10 microns in diameter, lead, sulfates, hydrogen sulfide, and vinyl chloride. 40 CFR Part 51 gives state and local agencies the authority to establish air quality rules and regulations. Rules adopted by the local air pollution control districts and accepted by the Air Resources Board are included in the State Implementation Plan. When approved by the U.S. EPA, these rules become federally enforceable.
Porter-Cologne Water Quality Control Act	Protects all waters of the state for the use and enjoyment of the people of California and declares that the protection of water resources be administered by the regional water quality control boards.
California Coastal Act (CCA) of 1976	This Act provides long-term protection of California's 1,100-mile coastline for the benefit of current and future generations. Coastal Act policies constitute the standards used by the Coastal Commission in its coastal development permit decisions and for the review of local coastal programs prepared by local governments and submitted to the Commission for approval. These policies are also used by the Commission to review federal activities that affect the coastal zone.

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Chapter 2. Description of the Proposed Action and Alternatives

This chapter describes the Proposed Action, the No-Action Alternative, and other identified Alternatives. The chapter provides detailed descriptions of equipment needs, construction requirements, and operational parameters for the Proposed Action. A short-term emergency protection of the northerly bridge abutment and piers, a temporary shoring project, and the retrofit of the bridge structure and stabilization of the northern riverbank, to ensure the usability of the bridge until a full bridge replacement is possible, were deemed as the only practicable action at the present time to protect essential utilities and communication lines, and personnel safety; maintain the only on-base transport route between North and South Vandenberg AFB; and provide access for mission-critical heavy payload transport.

The engineering descriptions provided within this section are based on the *Pre-Final 85% Submittal Repair 13th Street Bridge* dated January 31, 2003 (Penfield & Smith & Bengal 2003), and on the *Repair 13th Street Bridge Study* dated July 29, 2002 (Penfield & Smith & Bengal 2002).

2.1 Alternative A: No-Action

Under the No-Action Alternative measures to stabilize and retrofit the existing bridge structure and protect the riverbank would not be implemented. The river would continue flowing under its current pattern, and would continue to erode the bank and further threaten the structure. The No-Action Alternative would eventually result in the approach to the abutment becoming inaccessible and the bridge would then be rendered unusable. It is even possible that the entire structure would collapse.

Given the importance placed upon the bridge for Vandenberg AFB operations, this alternative is not acceptable. Should a collapse of the bridge occur, and given that design and funding for a bridge replacement has not been finalized, the Air Force would be impaired to complete its mission by not having access between North and South Vandenberg AFB. In addition, collapse of the bridge would likely cause significant environmental harm to the wetland and endangered species habitat in the Santa Ynez River, could result in the take of listed species, and would affect water quality within the Santa Ynez River.

2.2 Alternative B: Proposed Action

The Proposed Action includes three separate components: An emergency repair to protect the bridge against winter storms (completed in December 2002-January 2003); a temporary shoring project to ensure mission-critical payload transport across the bridge (started in April 2003); and a retrofit of the bridge to ensure the usability of the bridge until a full bridge replacement is possible (to be started in the summer of 2003). No repairs or protective actions are proposed for the southern riverbank and abutment.

The measures described in the Proposed Action are intended to slow down the damage being caused by erosion, and to temporarily strengthen the existing structure to support heavy payloads, i.e., those weighing over 20 tons. However, these interim measures will not bring the bridge up to current standards and codes as established by the American Association of State Highway and Transportation Officials (AASHTO) or the

California Department of Transportation (Caltrans), nor will it appreciably strengthen the bridge against seismic events.

An emergency short-term reinforcement to prevent the collapse of the bridge was completed between December 20, 2002 and January 17, 2003. The forecast 2002-2003 winter storms had the potential to raise the water level in the Santa Ynez River, which would have likely resulted in additional erosion and scouring around the bridge piers and abutment. Because this could lead to collapse of the bridge, a short-term emergency reinforcement was seen as the only alternative to protecting the existing structure. To accomplish the emergency repair, Vandenberg AFB requested a waiver from the normal Environmental Impact Analysis Process, in accordance with 32 CFR §989.36. The Deputy Assistant Secretary of the Air Force (Environment, Safety, and Occupational Health) granted this waiver on 20 December 2002 (Appendix B).

A Temporary Shoring Project was initiated on April14, 2003, to ensure the safe transport of time sensitive government payloads from the processing facility on North Vandenberg AFB to the launch facility on South Vandenberg AFB. The 13th Street Bridge is the only feasible transport route between these two sites. To accomplish this emergency work, Vandenberg AFB requested a waiver from the normal Environmental Impact Analysis Process, in accordance with 32 CFR §989.36. The Deputy Assistant Secretary of the Air Force (Environment, Safety, and Occupational Health) granted this waiver on 1 April 2003 (Appendix B). It was estimated that construction work associated with the installation of the temporary shoring would last for 42 days. However, Vandenberg AFB program changes in mid-April 2003 resulted in this work being put on hold on April 25, 2003. Construction work did not resume after that date.

The proposed retrofit of the bridge and stabilization of the northern bank would be started in the summer of 2003. It is estimated that the retrofit of the bridge will take approximately five months. The measures to be implemented during the proposed retrofit will control, inhibit, change, delay or minimize stream instability problems. Retrofit measures are common and often essential to resolve stability issues not addressed at the time of older bridge design and construction. This is the case with the 13th Street Bridge.

2.2.1 Emergency Repair

In December 2002, the Air Force declared the need to repair the bridge prior to the winter 2002-2003 storms an emergency. This emergency repair was designed to provide a temporary short-term protection of the bridge substructure and northerly abutment from winter 2002-2003 storms to prevent its collapse and the subsequent loss of essential utilities and communication lines, as well as the transportation capabilities between north and south Vandenberg AFB.

During this emergency repair, rock riprap was placed around the three northerly piers, and under and on the sides of the northerly abutment, approximately 70 feet upstream and 70 feet downstream from the centerline of the bridge, to temporarily protect the structure against winter flood events. This temporary riprap protection will be removed immediately prior to the temporary shoring project in April-May 2003 to accommodate for the construction activities and actions to be implemented at that time.

This emergency repair was implemented to prevent further irreversible damage to the bridge and to avoid collapse of the only transportation and communication route between North and South Vandenberg AFB.

2.2.1.1 Temporary Protection of the Pier Support System with Rock Riprap

Protection of the piers was accomplished by placing approximately 800 tons of rock (351 cubic yards) around the three northerly piers (7, 8, and 9) (Figure 2-1). Keyways approximately 10 feet deep were excavated around the piers to allow for the placement of a layer of rock approximately 10 feet deep at the base of each of the piers. A large backhoe/excavator operated from the riverbed to individually place the rocks. Approximately 1,465 cubic yards of soil were excavated and removed from around the piers to place the rock riprap. Excess material excavated in this operation was transported to a designated waste or fill site.

2.2.1.2 Stabilization of the Northerly Abutment with Rock Riprap

Stabilization of the northerly abutment entailed the installation of rock riprap in an area of the northerly bank approximately 70-feet upstream and 70-feet downstream of the abutment (Figure 2-1). It is estimated that 2,700 tons of rock (1,184 cubic yards) were placed along the bank adjacent to the northerly abutment. The rock was embedded approximately 10 feet below the existing toe of the bank forming a layer approximately 7 feet deep (Figure 2-2). Approximately 1,950 cubic yards of soil were excavated and removed from the embankment to place the rock riprap. Filter fabric was placed below the rock to prevent the rock from settling and becoming ineffective in protecting the bank. Excess material excavated in this operation was transported to a designated waste or fill site.

The rock was placed individually to ensure a stable surface that would provide stability and protection to the riverbank. The rock was placed from the top of the bank when possible, and the remainder from the riverbed. A large backhoe/excavator operated from the riverbank and from the riverbed to individually place the rocks.

2.2.2 Temporary Shoring Project

A temporary support system was proposed to reduce the operating stresses on the bridge superstructure, substructure and foundation piles from heavy loads. This temporary shoring was designed to ensure the near-term safe transport of mission-critical payloads across the bridge. On April 14, 2003, construction work began to implement this emergency action. However, a change in launch programs at Vandenberg AFB occurred in mid-April 2003. As a result of this change, the need to reinforce the bridge for the transport of mission-critical payloads in the near term was delayed. The emergency construction work ceased on April 25, 2003 and is it not foreseen that construction work will resume until that time when the bridge retrofit would be initiated (summer 2003).

During the construction period for the temporary shoring, the active river channel was temporarily maintained within two 48-inch pipes through the construction work area (Section 2.2.4.2) to minimize disturbance to water flow, to prevent equipment from sinking into the riverbed, and to prevent the river from continually feeding surface water onto the work site. Temporary berms were constructed with a dozer at the inlet and outlet of the two pipes to prevent damage to the shoring structure and work areas. The pipes and berms remained in place throughout this shoring project and were left in place after construction work ceased in anticipation of its need during the bridge retrofit in the summer of 2003 (Section 2.2.3).

Installation of the temporary shoring necessitated access to the riverbed through the access road created during the emergency repair (Section 2.2.4.1). Construction equipment used during this construction work included excavators, front-end loaders, all-terrain cranes and all-wheel-drive forklifts (Section 2.2.4.5).

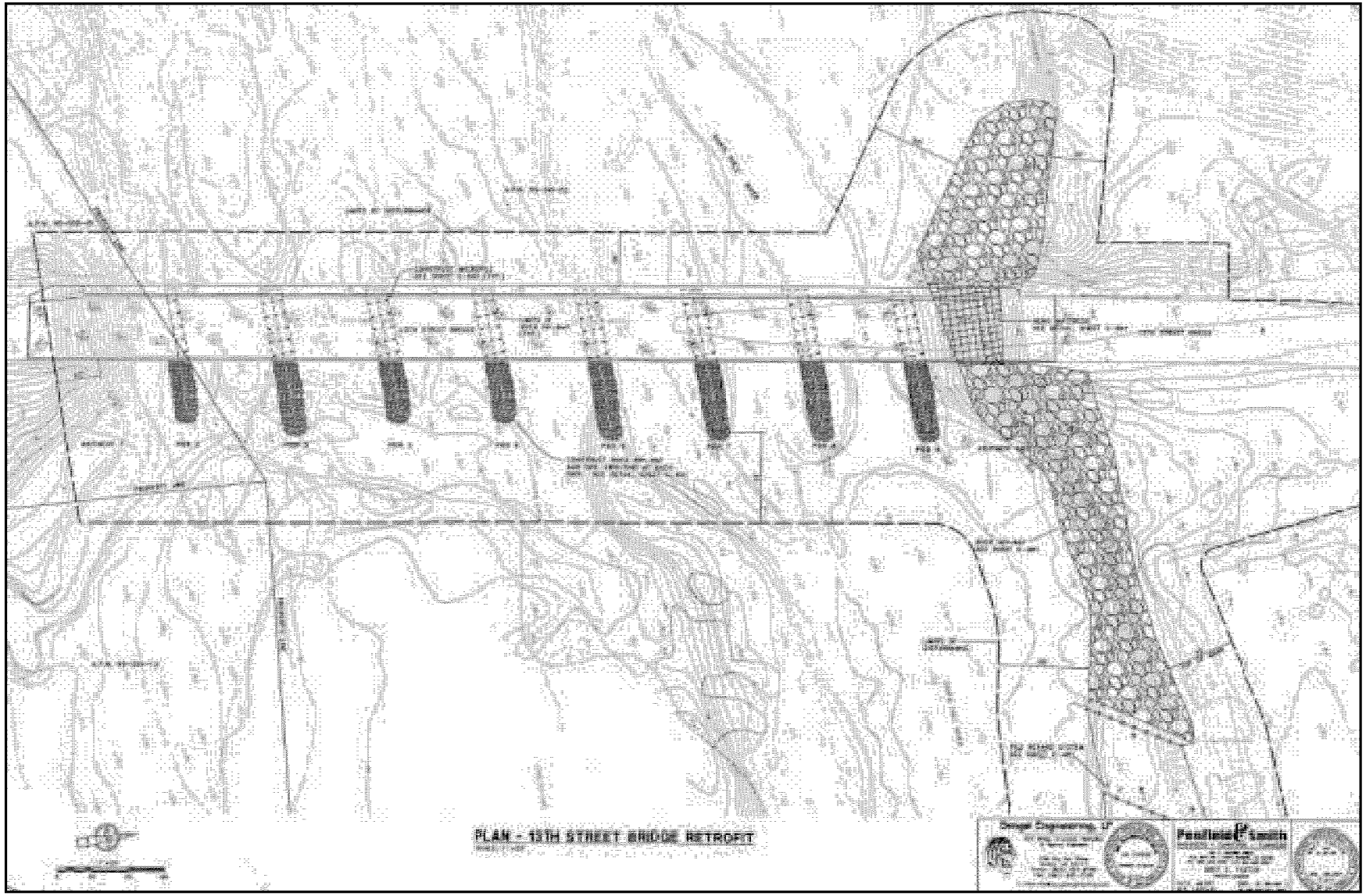

Figure 2-1. 13th Street Bridge at the Santa Ynez River. Reinforcement to northerly abutment and riverbank and to bridge piers.

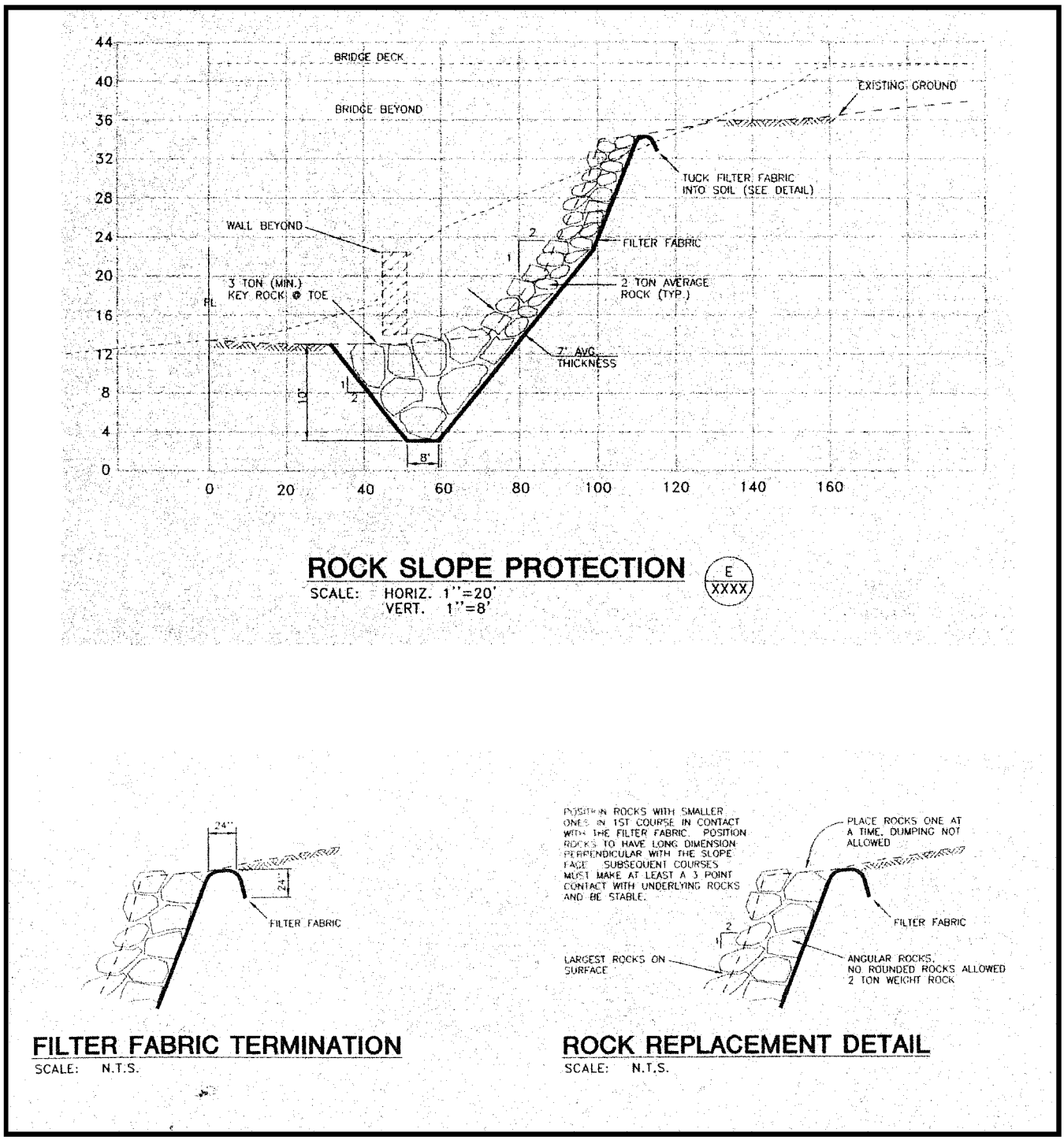

Figure 2-2. Details of rock riprap placement for northern bank protection at the 13th Street Bridge over the Santa Ynez River.

The rock riprap placed during the emergency repair to temporarily protect the three northerly piers (7, 8 and 9) and northern riverbank was removed. A large excavator operated from the riverbed and the riverbank to remove the rock riprap. The rock riprap was then temporarily placed on the upstream side of the temporary berms described above to minimize erosion (Section 2.2.4.2), and was left in place once construction work ceased in anticipation of its need during the proposed retrofit of the bridge.

The area of disturbance during this construction work was within the footprint of the construction work area for the proposed retrofit of the bridge (Section 2.2.4).

2.2.3 Proposed Bridge Retrofit

The proposed retrofit would entail the installation of retrofit components to protect the bridge substructure and superstructure, and the protection and stabilization of the northerly abutment and riverbank, until funding and permits for a new bridge are secured. The steel beam shoring bents installed during the temporary shoring project would be permanently removed at this time. The baserock placed to provide structural support to the bents is not anticipated to interfere with water flow within the river channels. Therefore, it will be left in place.

2.2.3.1 Retrofit of Bridge Substructure Including Piers and Northerly Abutment

The foundations of the bridge piers and the northerly abutment would be retrofitted to increase their strength and performance capacity. The retrofit would consist of reinforcing each pier wall with five micropiles, and each abutment with seven micropiles (a six to eight inch diameter steel pipe drilled and grouted into place). The existing pier wall connection to the pile cap will be strengthened through the addition of link beams between the piles, and a continuous concrete beam on top of the existing pile cap. In addition, rock riprap will be placed at the base of each pier wall and at the abutments. This retrofit work would help to distribute the vertical load to the soil and provide additional lateral resistance to the structure.

Soil-pile interaction would be improved with the use of pressure grouting and soil mixing around the piers and northerly abutment. Soil grouting would begin at approximately 10 to 12 feet below the flow line and extend downward to a level near the tip of the existing piles. This soil grouting and soil mixing would also improve the load bearing characteristics of the soil. In this operation 450 cubic yards of sodium silicate and calcium chloride would be mixed with the soil at the base of the piers and the northerly abutment. Once the foundations are improved, the pier walls would be strengthened with additional concrete and bar reinforcing steel, and the pile cap to pier wall connection improved by installing a link beam.

Excavation would be required to expose the existing pile caps adequately for the retrofit operation. It is anticipated that the excavation would not exceed 6-8 feet below the existing grade and that the total amount of excavation for this component of the project would be approximately 450 cubic yards. Excess material from these excavation activities would be transported to a designated waste or fill site.

Overhead clearance between equipment and bridge deck would control what measures and equipment is used to perform the work. At points where clearance is confined, such as the abutments, holes would be cut through the deck of the bridge and soil removed in front of the abutment to allow access. The structure may have to be stabilized with additional bracing to accommodate these operations.

Groundwater would likely be encountered during excavation and pumps would be required to dewater these excavation areas. In addition,

cofferdams, temporary watertight enclosures, may be required to control ground water.

Access to the riverbed below the bridge would be made possible with the temporary access road established for the emergency repair described in section 2.2.4.1.

2.2.3.2 Retrofit of Bridge Superstructure

The bridge superstructure would be strengthened by the addition of concrete to widen the existing "T" beams near the supports, to increase the negative moment capacity of the superstructure. Polymer composite fiber added to the bottom of the "T" beam girders will provide additional positive moment capacity to the span.

Falsework and scaffolding would be required under the existing bridge, extending approximately 15 feet beyond the downstream edge rails and 15-feet beyond the upstream training noses.

2.2.3.3 Protection of Northerly Riverbank and Bridge Abutment with Rock Riprap

Stabilization of the northerly riverbank and bridge abutment would entail the installation of rock riprap in an area of the northerly riverbank approximately 200 feet upstream and 110 feet downstream of the abutment (Figure 2-4). Rock riprap would also be placed in front of the northerly abutment (about 50 feet). It is estimated that 4,500 tons of rock (2,300 cubic yards) would be placed along the bank adjacent to the northerly abutment. The rock would be embedded approximately 10 feet below the toe of the bank and form a layer approximately 7 feet deep (Figure 2-5). Additional excavation beyond that described in section 2.2.1.2 would be required to prepare the northerly bank for placement of the rock riprap beyond the 70-foot limit upstream and downstream of the bridge. Approximately 450 additional cubic yards of soil would be excavated and removed from the embankment to place the rock riprap. Filter fabric would be placed below the rock to prevent it from settling and becoming ineffective in protecting the bank. Excess material excavated in this operation will be transported to a designated waste or fill site.

The rock would be placed individually to ensure a stable surface that would provide stability and protection to the riverbank. Where possible, the rock would be placed from the top of the bank, and the remainder from the riverbed. A large backhoe or excavator would operate from the riverbank and from the riverbed below to individually place the rocks, to ensure a stable surface that provides stability and protection to the riverbank. Wire baskets would be filled with rock and pulled into place underneath the bridge deck at the northerly abutment to provide protection to the abutment at this location. The rock riprap temporarily placed at the berms of the 60-inch pipe for maintenance of river flow (section 2.2.4.2) would be used in this operation.

The temporary access road created for the emergency repair (see section 2.2.4.1) and exposed with the removal of the rock riprap from the northerly bank during the temporary shoring project would be used to access the work area.

2.2.3.4 Stabilization of the Riverbank Upstream of the Northerly Abutment

Stabilization of the northerly riverbank upstream of the rock riprap would entail the installation of a 750-foot long pile retard system. This system consists of a succession of steel piles (12 in wide x 53 in long) placed in single rows (bents) radiating out from the eroded bank, somewhat perpendicular to the flow of the river (Figure 2-3). The system proposed for stabilization of the northerly riverbank upstream of the 13th Street Bridge would consist of approximately 10 bents of 50-

foot long driven piles (about 183 piles) from the bank running toward the channel center line to meet the flow of the river. Approximately one mile of cabling will run continuously from pile to pile as it protrudes into the stream (Figure 2-4). As water flows between the cabling, debris is collected and the velocity of the water is reduced. Sediment drops out of the water as a result of the loss of velocity, leaving sediment at the base of the piles. Over time, the sediment builds up and the flow of the river would move southerly, away from the piles, providing long-term protection at the northerly bridge abutment and the existing bank. The area between each bent adjacent to the riverbank would be revegetated to aid in decreasing water velocity. This system has been used effectively near eroded banks of the Santa Ynez River in several locations upstream of the 13th Street Bridge.

Construction equipment for placement of the pile retard system would consist of a crane with a pile-driving hammer, and delivery trucks. This equipment would operate from the riverbed to drive the piles in place.

2.2.4 Construction Requirements

Construction activities associated with the emergency repair lasted 28 days, and construction activities associated with the temporary shoring project lasted approximately 11 days. The proposed retrofit is expected to last five months. Work would be limited to daylight hours only. While some of the work would occur from on top of the bridge deck, access to the riverbed would also be needed. Construction activities would be confined to the area in the riverbed 60 feet upstream and 30 feet downstream from the bridge, and along the northern half of the riverbed, approximately 900 feet upstream and 150 feet downstream of the northerly abutment, and extending up to 450 feet towards the center of the riverbed (Figure 2-5). Equipment present in the riverbed would be performing construction or transporting materials to and from the various construction sites. An area outside the river near the bridge, along the banks and adjacent to the northern approach to the bridge, would be used for staging and storage purposes. Access across the bridge during the retrofit construction on the bridge substructure and superstructure – 90 days – would be restricted to construction traffic, and emergency vehicles.

2.2.4.1 Riverbed Access

Temporary access roads would be required to access the riverbed, bridge substructure and supporting piers. Approximately 5,875 cubic yards of soil and 5,990 cubic yards of shale would be used to create temporary access roads.

Emergency Repair

Access to the construction area at the northerly abutment and to piers 7 through 9 in the riverbed was created adjacent to the abutment. A pre-existing inactive access road on the downstream side of the northerly abutment was cleared of growing vegetation (mostly disturbed Central Coastal Scrub dominated by coyote brush [*Baccharis pilularis*]), and was temporarily reestablished for access to the abutment and piers and placement of the rock riprap. Soil from the Terra Road borrow site was used to provide a firm surface to appropriately support travel by construction equipment on very soft soil. The soil at the embankment was compacted, geotextile fabric laid out, and borrow site shale/soil placed on top to provide a hard stable surface for the equipment. This road extended approximately 60 feet upstream and 60 feet downstream from the northerly abutment, and had a 20-foot wide base. Prior to compacting the soil, large vegetation (greater than 2.5 inch diameter) was cleared using hand-held chain saws. Root systems were left intact. Smaller vegetation present in the path of the road was crushed during road installation. Because this temporary access would be used during the proposed

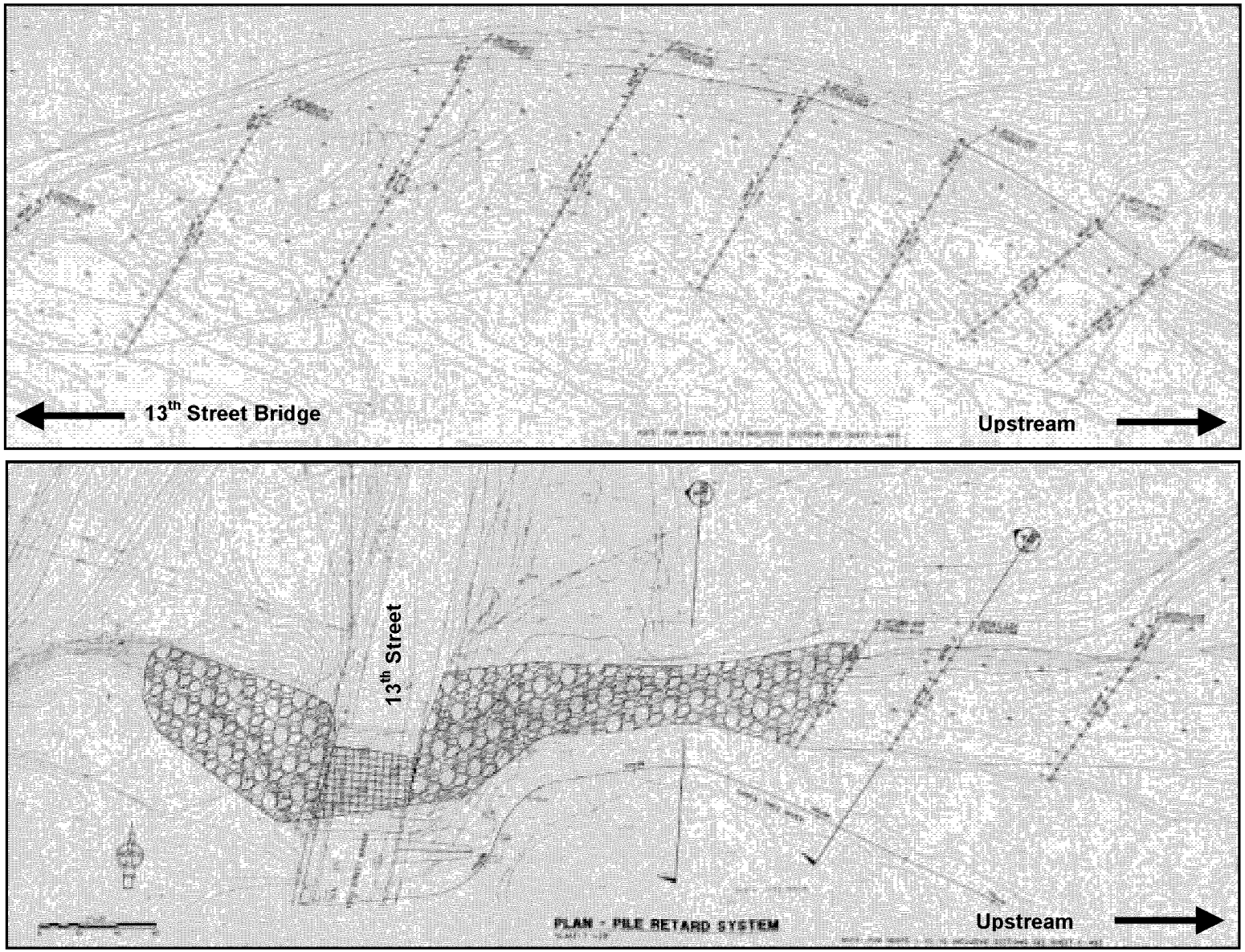

Figure 2-3. Rock riprap at northerly abutment and riverbank, and pile retard system proposed for bank protection upstream of the 13th Street Bridge at the Santa Ynez River.

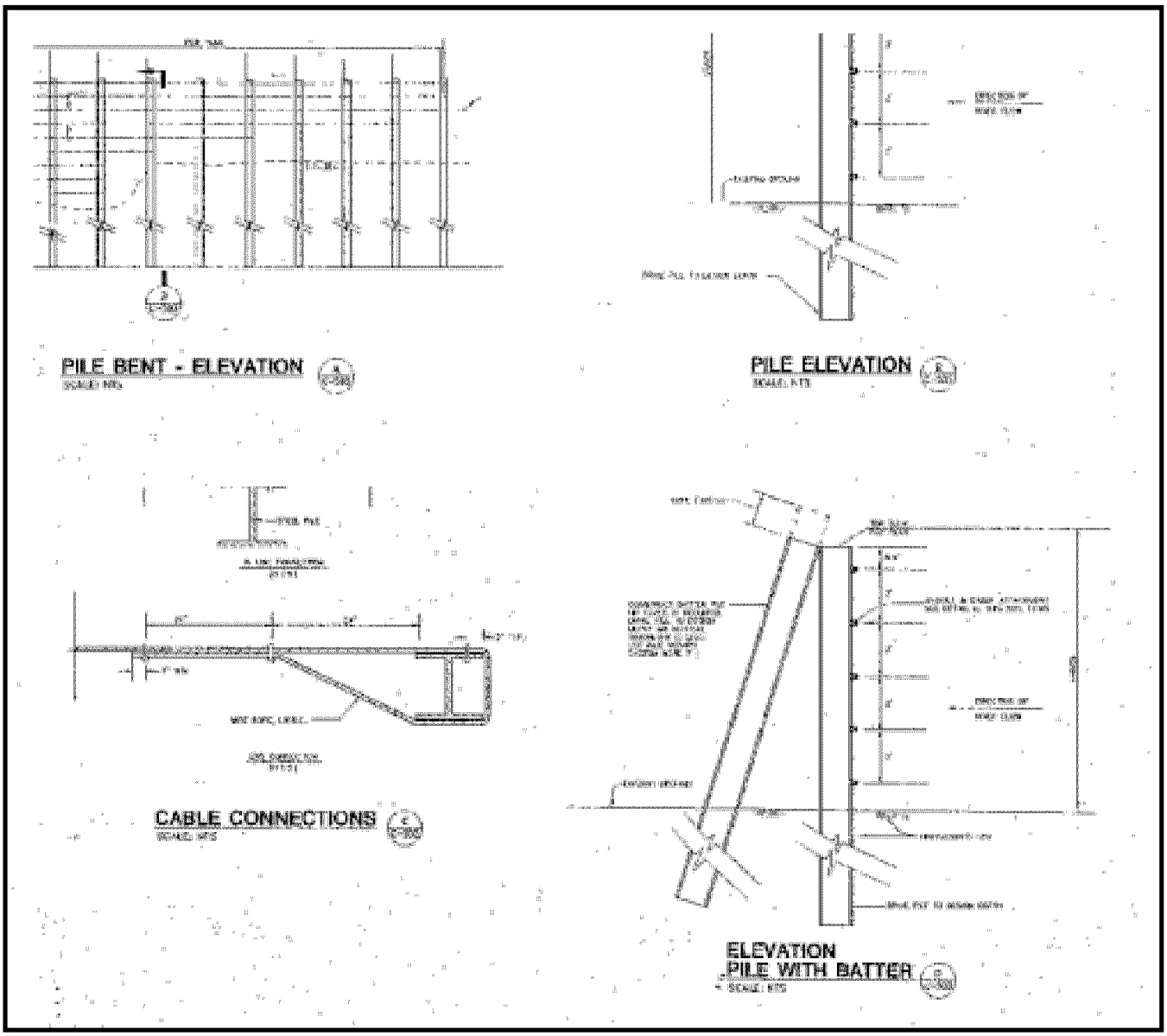

Figure 2-4. Details of the pile bents of the pile retard system proposed for the protection of the riverbank upstream of the 13th Street Bridge at the Santa Ynez River.

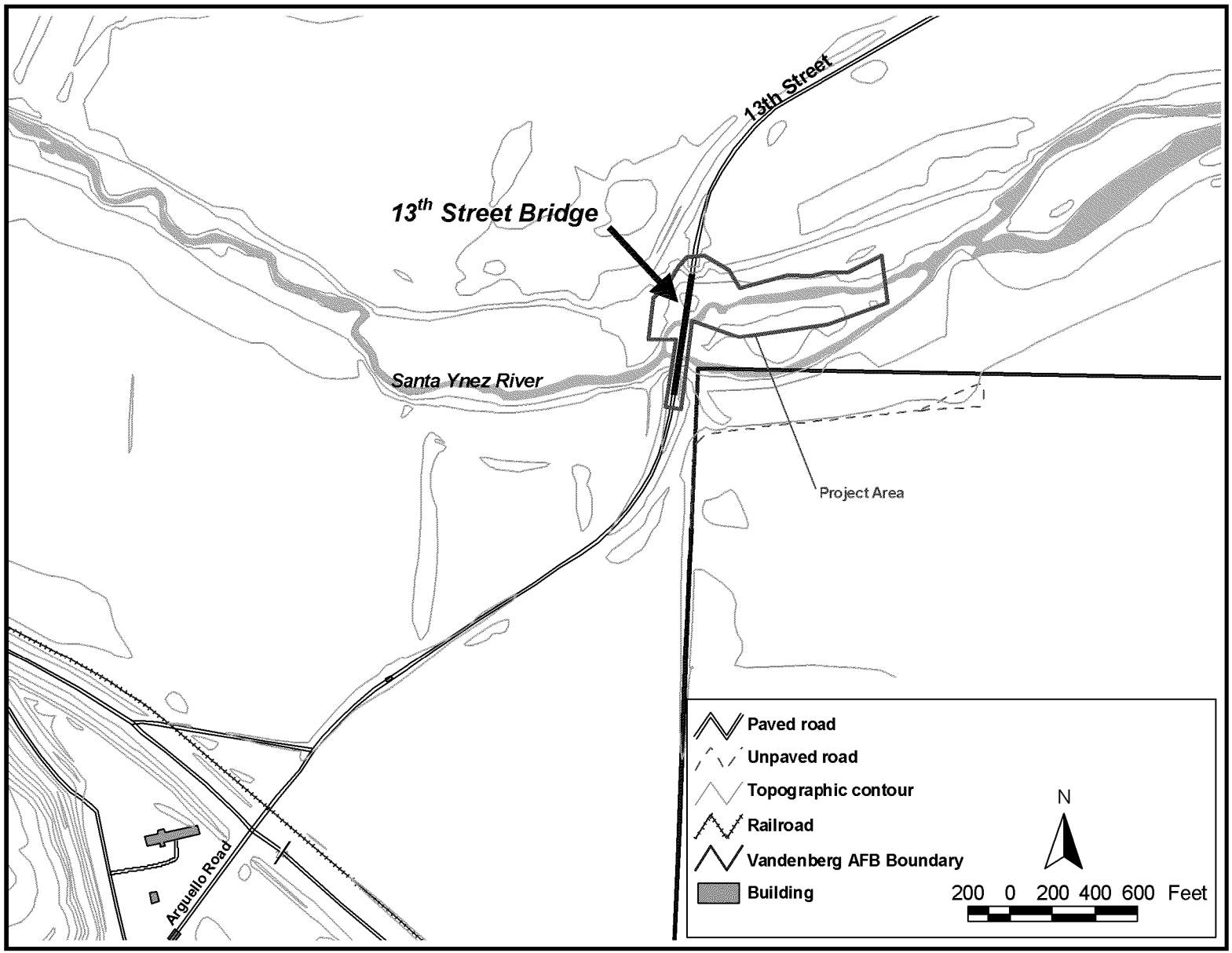

Figure 2-5. Construction limits for the proposed retrofit of the 13th Street Bridge at the Santa Ynez River.

retrofit, and it would not interfere with channel flow, it was maintained and covered by the rock riprap placed along the embankment. The road would be removed as the rock riprap is placed on the abutment and the embankment during the proposed retrofit.

All construction equipment operating within the riverbed did so within 60 feet upstream and 30 feet downstream of the bridge.

Temporary Shoring Project

Access to the riverbed and the construction area at the piers was accomplished through the temporary access road created for the emergency repair adjacent to the northerly abutment. In addition, two temporary access roads were built across the riverbed, one on the upstream side and one on the downstream side of the bridge. Both of these roads were built within 30 feet of the bridge structure and crossed over the temporary culverts installed between piers 8 and 9 to maintain unobstructed river flow (Section 2.2.4.2). These roads were necessary to provide access to the base of all piers (9 through 2). Soil from the Terra Road borrow site was used to raise the roadway approximately 6 feet above the riverbed. The riverbed soil was then compacted, geotextile fabric laid out, borrow site soil put in place, and shale placed over this additional soil to provide a hard stable surface for the equipment. These roads are approximately 475 feet long with a 20-foot wide base. These temporary roads were left in place after work ceased in anticipation of their need during the proposed retrofit.

All construction equipment operating within the riverbed remained within the established construction area footprint for the proposed retrofit (60 feet upstream and 30 feet downstream of the bridge).

Proposed Retrofit

Access to the riverbed and the construction area at the piers would be through the temporary access road created for the emergency repair adjacent to the northerly abutment, and the two temporary roads adjacent to the bridge created for the shoring project. Ten-foot extensions would be placed between each pier to allow equipment access to the piers.

Prior to compacting the riverbed soil, large vegetation (greater than 2.5 inch diameter) would be cleared using hand-held chain saws. Root systems would be left intact. Smaller vegetation present in the path of the road would be crushed during road installation. The shale, borrow site soil, and geotextile fabric used for the construction of this road would be removed upon completion of the project.

Temporary access to the riverbed approximately 900 feet upstream of the bridge, would be needed for construction activities associated with the installation of the pile retard system. This access would have varying widths between 100 feet and 200 feet from the northern riverbank towards the center of the riverbed. The soil would be compacted, geotextile fabric laid out and shale placed over the fabric to provide a hard stable surface for the equipment. Prior to compacting the soil, large vegetation (greater than 2.5 inch diameter) would be cleared using hand-held chain saws. Root systems would be left intact. Smaller vegetation would be crushed during installation of this temporary access. This access would not interfere with flow of water because the area required for construction access would not reach the river channel. The shale, and geotextile fabric used for the construction of this road would be removed upon completion of the project.

2.2.4.2 Maintenance of River Flow

Emergency Repair

Because river flow increased significantly with the late fall rainstorms, temporary containment of the river was necessary to enable equipment to access and operate from within the riverbed.

Temporary containment was accomplished by installing a K-rail barrier (2 feet at the base and 2.7 feet high) 60 feet upstream of the bridge from the northern embankment toward the center of the riverbed to approximately halfway between piers 7 and 6 (210 feet) and then turning downstream between these two piers past the bridge structure (120 feet). This barrier was slightly directed downstream so river flow would be directed more gently. Filter fabric was placed underneath the K-rails and 10-30 ml high-density polyethylene (HDPE) liner over the K-rails towards the river flow. The HDPE liner was held in place with precast concrete blocks approximately 12 inches in diameter and weighing 370 pounds each. The back side of the K-rails was supported with sand from the riverbed. This K-rail barrier was maintained in place throughout the construction period until all equipment operation from the riverbed was completed (approximately 21 days).

Temporary Shoring Project

Temporary containment of the river was necessary to prevent equipment from sinking into the riverbed and to prevent the river from continually feeding live surface water directly onto the excavation sites. Containment was accomplished by impounding the channels at a location upstream of the construction limit and installing two 48-inch HDPE pipes that allowed the active river channel to pass through the worksite between bridge piers 8 and 9, underneath the temporary riverbed access roads, and without impediments or construction disturbance. These pipes are approximately 160 feet long and were in place throughout the construction period for the temporary shoring project and the proposed retrofit. In addition, temporary berms were constructed at the inlet and outlet of this pipe to direct seasonal river flows to prevent inundation of the work areas. A dozer and front-end-loader were used to create the berms. To minimize the potential for erosion of these berms from seasonal river flow, the rock riprap removed from around the piers and the northern bank was placed on the upstream side of the berms. Additional reinforcement was provided with concrete K-rails, as was done during the emergency repair to maintain the river channel within the pipes. The temporary pipes were left in place once construction work ceased in anticipation of their need during the proposed retrofit.

Proposed Retrofit

Temporary containment of the river necessary to prevent equipment from sinking into the riverbed and to prevent the river from continually feeding live surface water directly onto the excavation sites would be accomplished with the 48-inch HDPE pipes installed during the temporary shoring project. These pipes would be extended upstream of the bridge (950 feet) for the proposed retrofit to ensure the active river channel can pass unobstructed and undisturbed through the construction area. It is expected that the pipes would be in place throughout the construction period for the proposed retrofit (five months) and would be removed at the conclusion of the construction work in the riverbed.

Subsurface flow will be controlled with the use of pumps and cofferdams during individual excavations. To prevent sediments from being dispersed into the river, filters will be used at these sites.

2.2.4.3 Material Storage Area and Work Area

Emergency Repair

A construction staging area (for parking and maintenance of equipment and storage of construction materials) was created outside of the riverbed on both sides of 13th Street near the northern approach to the bridge. The existing flat area at the northeast approach to the bridge was too small to accommodate all of the construction work and storage needs. An additional section, approximately 1.0 acre, was created adjacent to the temporary access road at the northwest approach to the bridge.

The vegetation in these areas was removed at ground level, and the areas were graded where required.

Temporary Shoring Project

Construction equipment and materials were staged in the same areas created during the emergency repair outside of the riverbed on both sides of 13th Street near the northern approach to the bridge.

Proposed Retrofit

In addition to the staging areas described under Emergency Repair, additional short-term storage space for temporary staging of materials within the riverbed would be needed during the proposed retrofit. The areas most suitable for this are situated within the existing unvegetated sandbar upstream of the bridge (Figure 2-6). No additional vegetation will be removed to provide access to this area, and grading will not occur. Access to this area will be through the temporary access created parallel to the riverbank and which will span up to 900 feet upstream of the river (Section 2.2.4.1). Construction materials that will be stockpiled in these areas will include shoring and falsework form lumber, erosion control devices, stone aggregates, and tools needed to build and erect the scaffolding to retrofit the bridge and provide bank protection.

2.2.4.4 Equipment Servicing

Emergency Repair

Equipment was fueled or serviced a minimum of 500 feet outside of the riverbed, near the northern approach to the bridge. Any vehicles requiring servicing were worked on in this designated area outside the riparian corridor prior to entering the riverbed.

Temporary Shoring Project

Equipment was fueled or serviced a minimum of 500 feet outside of the riverbed, near the northern approach to the bridge. Prior to entering the riverbed, any vehicles requiring servicing were worked on in the designated area outside the river and riparian corridor.

Proposed Retrofit

Equipment would be fueled or serviced a minimum of 500 feet outside of the riverbed, near the northern approach to the bridge. Prior to entering the riverbed, any vehicles requiring servicing will be worked on in the designated area outside the river and riparian corridor.

However, large cranes may require disassembly to reach the work site and may require crane mats to sit on or move to keep from sinking. Removing this equipment for fueling may not be feasible because of the time to set up the equipment to work safely. Should refueling operations be necessary for large cranes operating within the riverbed, these operations will incorporate safety measures such as temporary catch pans or basins to place under the fill areas to catch accidental overflow. The Contractor will prepare a spill prevention/ containment plan (See Sections 4.1.5 and 4.2.4). Moving this equipment out of the river to refuel would delay work and extend project duration.

Figure 2-6. Aerial view of 13th Street Bridge vicinity and suggested short-term staging area in upstream unvegetated sandbar for proposed retrofit project.

2.2.4.5 Construction Equipment

The equipment used during the emergency repair is listed in Table 2-1. Equipment projected for the temporary shoring project and the proposed retrofit are listed in Tables 2-2 and 2-3 respectively. These lists include the length of time each is expected to be in operation throughout the construction period. The exact type of equipment that would be used during the proposed retrofit may vary slightly from the projections below depending on the contractor's capability. However, these estimates provide a basis for analyzing related issue areas such as air quality, noise, and traffic.

Table 2-1. Equipment use during the 30-day construction period of the Emergency Repair.

Equipment	Quantity	% Use
Excavator Cat 245	2	90%
Loader with front bucket	1	90%
Rubber wheel loader	1	90%
Water truck (2,500 gallon)	1	50%
Pick-up truck	4	25%
6-wheel rubber tired haulers	3	90%
End dump truck	2	50%
Rock delivery truck	8	50%
Miscellaneous delivery trucks	6	50%

Table 2-2. Equipment use during the 11-day construction period for the Temporary Shoring.

Equipment	Quantity	% Use
Excavator	1	15%
	2	10%
	1	3%
	1	1%
Front-End-Loader	2	15%
	2	10%
	1	3%
	2	1%
Motorgrader	1	15%
	1	10%
Articulating Dump Truck	3	5%
Dozer	2	15%
	1	3%
	1	2%
	1	1%
Water truck	1	4%
	1	2%
Semi-truck	8	15%
All-terrain crane	2	10%
All-wheel-drive forklift	2	10%

Table 2-3. Equipment use during the five-month construction period of the Proposed Retrofit.

Equipment	Quantity	% Use
Excavator	4	85%
75 ton crane	2	85%
25 ton crane	1	85%
Dozer	2	25%
Pick-up truck	3	95%
Water truck	1	85%
Rubber tire loader	2	50%
End dump truck	2	30%
Flatbed truck	4	75%
Backhoe/skip loader	3	85%
Pile driver/auger	2	50%
Work lift (man lift)	2	85%
Sheet pile driver	1	25%
Concrete coring equipment	1	10%
Fork lift	1	75%
Pressure grouting equipment	1	25%
Vibrating compactor	1	25%
Dewatering pump	4	80%
Electrical generator	4	90%
Air compressor	2	50%
Concrete boom truck	2	25%
Ready mix truck	4	30%
Rock delivery truck	8	25%
Pile delivery truck	3	20%
Miscellaneous delivery trucks	4	40%

2.2.4.6 Construction Schedule and Workforce

Emergency Repair

The emergency repair occurred during the rainy season. Construction lasted 27 days and the average number of construction personnel present at the work site each day was five.

Temporary Shoring Project

The temporary shoring occurred outside the rainy season, during late spring. Construction was expected to last 42 days. However, the project was ceased after 11 days of construction work. The average number of construction personnel present at the work site each day was between 5 and 10.

Proposed Retrofit

The proposed retrofit would begin during summer 2003. Construction is expected to last five months and the average number of construction personnel present at the work site each day would be between 25 and 30. Specifically:

- Removal of the temporary riprap around the bridge pier support system and northerly abutment is expected to take 10 days. It is estimated that the number of personnel needed to perform this task would be seven.
- The retrofit of the substructure and the superstructure is expected to take 90 days. It is estimated that the number of personnel needed to perform this task would be 10.
- The pile retard system is expected to take 70 days to complete. The number of personnel needed for this task would be eight.
- Lastly, the soil grouting operations will take about 25 days. The number of personnel needed for this task would be five.

2.2.5 Construction Constraints and Monitoring

2.2.5.1 Biological Resources

Measures implemented during the December 2002-January 2003 emergency repair and the April 2003 temporary shoring project for the protection of special status species and their habitats, derived from informal consultation with the USFWS and NOAA Fisheries, and included:

1. Disturbances of the riverbed were the minimum necessary to accomplish project objectives, and were limited to placement of the temporary access road and K-rail barrier, limited excavation around the piers, and rock riprap installation at the northerly bridge abutment and around the three northernmost piers.
2. All excess materials excavated were removed from the riverbed and transported to a designated waste or fill site.
3. All construction equipment and holding tanks were staged, repaired, and maintained at least 500 feet outside the riverbed, wetlands, and riparian corridor of the Santa Ynez River. Fueling and addition of oil/fluids to equipment was done on impervious surfaces only. Spill containment material was placed around the equipment before fuels (or other hazardous substances such as oil or brake fluid) were brought in.
4. Stationary equipment operating within the riverbed was placed on protective mats to prevent contamination of the riverbed.
5. Standard procedures were used to ensure that all equipment was maintained properly and free of leaks during operation, and all necessary repairs were carried out with proper spill containment. The construction contractor submitted a Spill Prevention Plan for 30th CES/CEV approval.
6. Hazardous materials were properly stored and managed in secured areas located outside the floodplain.
7. Hazardous materials were procured through or approved for use by Vandenberg AFB Hazmart to minimize waste. The Contractor reported their monthly usage of hazardous materials to the Hazmart to meet legal reporting requirements.

8. To the greatest extent possible, construction was conducted from the temporary access roads. Intrusion into the wetlands within the riverbed and the riparian habitat on either side of the river was minimized.
9. Construction did not occur without the presence of a qualified biological monitor on the project site.
10. Removal of native vegetation and plant communities, particularly riparian woodland and wetland vegetation, were minimized during project implementation to the greatest extent possible.
11. Where feasible, non-native wetland and riparian vegetation with the project area (e.g., *Arundo donax* that is present near bridge piers) was removed during construction activity.
12. A qualified biologist developed a draft habitat restoration and monitoring plan for each habitat area affected (Appendix D).
13. Installing a temporary K-rail barrier 60 feet upstream of the construction zone and maintaining river flow between piers 6 and 7 accomplished temporary containment of the river channel.
14. Qualified biological monitors, approved by 30th CES/CEVPN, NOAA Fisheries, and USFWS, including personnel who are familiar with and possess necessary permits to capture, handle, and release tidewater gobies, Southern steelhead, and California red-legged frogs, monitored construction activities throughout the project to minimize impacts to all special-status plant and wildlife species, jurisdictional wetland resources, and other native plant communities found in the project area. The biological monitor was responsible for flagging areas where special-status species are located or concentrated, relocating special-status species in jeopardy of being killed or injured by construction and dewatering activities, and inspecting equipment and equipment staging areas for gas and oil leaks.
15. A screen (no larger than 0.25-inch mesh size) was installed at the end of dewatering pumps to prevent entrapment of southern steelhead, tidewater gobies, and California red-legged frogs.
16. Temporary containment of the river channel into pipes was not conducted until a qualified biologist had successfully placed block nets in the channel and removed all live fish in the channel within the project area (see below #17 and #31). The temporary containment of the river channel into culverts for construction purposes allowed water to flow unobstructed to downstream channels and segments. The main flow channel and stream segments will be restored to their previous conditions to the extent possible after construction is completed. A qualified biologist will be present during the installation of the culverts.
17. Before beginning project construction activities, exclusion nets and a drift fence were installed to exclude tidewater goby, Southern steelhead, California red-legged frog, and other special-status aquatic species from the project area. Block nets were set up within the main channel of the Santa Ynez River 50 feet upstream and 50 feet downstream of the project area, to exclude tidewater goby, Southern steelhead, larval California red-legged frog, and other aquatic special-status species from the project area. Each block net had a maximum one-eighth-inch mesh size so that these species could not swim through or be caught in the net. Monitoring occurred during all times that construction activities occur within the riverbed. Collecting and releasing of fish and California red-legged frog tadpoles took place one to two hours before use of construction equipment began. Whenever possible, collecting and releasing of adult

and sub-adult California red-legged frogs was conducted each night before construction, between 1 hour after sunset and midnight, during the period when California red-legged frogs were most active. Qualified biologists, approved by 30th CES/CEVPN, NOAA Fisheries, and USFWS, conducted relocation and monitoring for these species before and during construction.

18. Permanent barriers to upstream fish migration in the Santa Ynez River (i.e., vertical drops of more than 7.5 to 10 centimeters [3 to 4 inches]) were not created.
19. Qualified biologists trained all project personnel prior to participating in project implementation activities. At a minimum, the training included a description of the listed species occurring in the area, the general provisions of the ESA and the necessity of adhering to the provisions of the ESA, the penalties associated with violations of the ESA, the general measures being implemented to conserve these species in the project area, and the specific measures and restrictions regarding project implementation.
20. All human generated trash at the project site was contained and removed from the work site and disposed of properly at the end of each workday. All construction debris and trash was removed from the work area upon completion of the emergency repair.

In addition to the measures described above, the following additional measures will be implemented during the proposed retrofit:

21. The construction contractor will provide the biological monitors with a schedule of planned construction activities 48 hours in advance.
22. Protective mats will be used whenever possible during the proposed retrofit for stationary equipment operating within the riverbed. Non-stationary equipment will be operated on established temporary access roads whenever possible, and the time it is operated outside of these roads will be minimized to the greatest extent possible.
23. All brush piles resulting from vegetation removal will be removed from the riverbed by the end of each workday.
24. Water quality parameters will be determined (e.g., salinity, temperature, dissolved oxygen, turbidity) prior to initiation of the proposed retrofit. Samples will be taken in a manner that minimizes harassment or mortality to tidewater gobies. These parameters will be used during and after construction to monitor water quality.
25. Pre-construction surveys for California red-legged frogs will start one week prior to initiation of construction activities and will follow USFWS recommended survey protocol.
26. California red-legged frogs captured during surveys or during construction activities will be relocated to suitable habitat downstream or upstream of the construction zone, or transported and relocated to suitable habitat outside the vicinity of the construction zone.
27. If refueling of equipment within the riverbed is required (i.e., oversize cranes), safety measures such as temporary catch pans or basins to place under the fill areas to catch accidental overflow will be implemented. A riverbed refueling spill prevention and containment plan will be prepared by the Contractor and submitted to 30th CES/CEV for approval.
28. If any equipment repairs are necessary within the riverbed or the riparian corridor, repair will not begin without implementation of a spill prevention and containment plan, and the presence of a qualified biological monitor on the project site.

29. Chemical stockpile spill containment, if necessary, will be accomplished to minimize or preclude hazardous releases.

30. The upstream extension of the culverts installed during the temporary shoring project (see above #16) to contain the river channel will not conducted until a qualified biologist has successfully placed block nets in the channel and removed all live fish in the channel within the project area (see below #31). The culverts will allow water to flow unobstructed to downstream channels and segments. The main flow channel and stream segments will be restored to their previous conditions to the extent possible after construction is completed. A qualified biologist will be present during the installation of the extensions to the culverts.

31. Before beginning project construction activities, exclusion nets and a drift fence will be installed to exclude tidewater goby, Southern steelhead, California red-legged frog, and other special-status aquatic species from the project area. Block nets will be set up within the main channel of the Santa Ynez River 50 feet upstream and 50 feet downstream of the project area (i.e., 950 feet upstream and 200 feet downstream of the northerly abutment at the 13th Street Bridge), to exclude tidewater goby, Southern steelhead, larval California red-legged frog, and other aquatic special-status species from the project area. Each block net will have a maximum one-eighth-inch mesh size so that these species do not swim through or are caught in the net. Silt fencing or other similar material will be used to construct a drift fence around the entire perimeter of the project area to exclude adult and sub-adult California red-legged frogs from the project area. The drift fence will be set back 50 feet from the boundaries of the project area and will be securely anchored at the bottom. After the net and drift fence are installed and within the two days prior to construction, tidewater gobies, southern steelhead, all lifestages of the California red-legged frog, and other aquatic special-status species within the exclusion zone will be collected and relocated downstream of the project area. The main channel of the Santa Ynez River as well as all side channels and isolated pools within the exclusion zone will be searched for these species. Monitoring will occur during all times that construction activities occur within the riverbed. Collecting and releasing of fish and California red-legged frog tadpoles will take place one to two hours before use of construction equipment begins. Whenever possible, collecting and releasing of adult and sub-adult California red-legged frogs will be conducted each night before construction, between 1 hour after sunset and midnight, during the period when California red-legged frogs are most active. Qualified biologists, approved by 30th CES/CEVPN, NOAA Fisheries, and USFWS, will conduct relocation and monitoring within the exclusion zones for these species before and during construction.

32. Nets and fencing will be opened up after work is completed for the day, and left open all night to permit fish passage.

33. To avoid potential noise impacts to breeding Southwestern willow flycatchers, a qualified permitted biologist will conduct pre-construction surveys for Southwestern willow flycatchers within 1,000 feet of the construction limit line. If work occurs during the May-August nesting season, the surveys will follow the protocol published by the USFWS (as revised July 2000). If territorial and/or breeding Southwestern willow flycatchers are found within the survey area, nesting birds will be monitored to determine impacts, if any, of construction-related disturbance. No personnel (other than the qualified biological monitor) or equipment will be

permitted outside of the defined work area in proximity to nesting flycatchers.

34. A contingency plan will be developed by qualified biologists familiar with the species for the recovery and salvage of tidewater goby, Southern steelhead, and California red-legged frog, in the event of a local toxic spill or accidental dewatering of their habitat.

35. All existing swallows nests will be inspected for the presence of unfledged swallows or unattended juvenile bats. If any are found, they will be monitored and disturbance minimized as much as possible.

All permit conditions, minimization measures, and BMPs would be implemented to minimize potential adverse impacts to water resources.

2.2.5.2 Water Quality

The Central Coast Regional Water Quality Control Board (CCRWQCB) recommended the following measures to address concerns pertaining to water quality:

1. Disturbance of the streambed shall be the minimum necessary to accomplish project objectives, and shall be limited to placement of the K-rail barrier, limited excavation around piers 6, 7, 8, and 9, and riprap installation at the northerly bridge abutment and around the four northernmost piers.

2. Construction shall not occur without the presence of qualified biological and archaeological monitors on the project site.

3. A construction staging area shall be designated prior to start of work, and shall be located at least 500 feet outside the riverbed, wetlands, and riparian corridor of the Santa Ynez River. All construction equipment and holding tanks will be staged, repaired, and maintained at the designated staging area. For equipment which must be fueled or which required additional oil/fluids, this activity shall take place on impervious surfaces at the designated construction staging area.

4. Standard procedures shall be followed to ensure all equipment is properly maintained and free of leaks during operation, and all necessary repairs shall be carried out with proper spill containment.

5. Adequate spill response supplies shall be maintained at the construction staging area for immediate response and clean-up of any fuel spills.

6. Removal of native vegetation and plant communities, particularly riparian woodland and wetland vegetation, shall be minimized to the greatest extent possible.

7. Should existing vegetation in the streambed, riparian area, or jurisdictional wetland affected by the Project require trimming or removal, the removed vegetation shall be gathered from site and disposed of at a designated waste or fill site.

8. After repair on the streambed has been completed, the main flow channel and stream segments shall be restored to their previous conditions to the maximum extent possible, including the removal of all K-rail barriers and geotextile barriers.

9. Excess materials excavated from the streambed or riparian areas shall be transported to a designated waste or fill site.

10. A restoration plan for the areas of temporary impact resulting from construction of the access road shall be developed and submitted to the CCRWQCB.

11. A mitigation plan for areas of permanent impacts resulting from the placement of riprap shall be developed and submitted to the CCRWQCB.

In addition to the above measures, the following measures will be implemented during the proposed retrofit:

12. The active river channels will be contained at a location upstream of the construction limit and within a 60-inch HDPE pipe. This pipe will be approximately 1,200 feet long and traverse the length of the construction zone, to provide unimpeded river flow through the project area.

13. Water pumps used to dewater excavated areas will incorporate filters. Pumped water will be discharged in vegetated area downstream of the project area.

14. Silt fencing will be erected in all needed areas to prevent sediment loading.

15. The storage of hazardous materials in proper containers to include secondary containment, within the staging areas outside the riverbed.

16. A spill prevention plan for the project will be developed by the contractor and approved by 30th CES/CEV. At a minimum, this plan will address measures to prevent fuels and other hazardous fluids spills, and concrete spills.

17. A riverbed refueling spill prevention and containment plan will be developed by the contractor and approved by 30th CES/CEV.

18. A SWPPP will be developed by the contractor and approved by 30th CES/CEV, will be implemented.

2.2.5.3 Air Quality

The following standard APCD dust control measures will minimize fugitive dust emissions from ground disturbing activities.

1. Apply water (preferably reclaimed) at least twice daily to dirt roads, graded areas and dirt stockpiles to prevent excessive dust from leaving the staging areas. No chlorinated water will be allowed to run into river.
2. Minimize vehicle speeds on exposed earth.
3. After completion of construction activities, treat disturbed soil by watering, revegetating, or spreading soil binders to prevent wind erosion of the soil.
4. Disturb the smallest practical amount of area and minimize the disturbance time.
5. Designate personnel to monitor construction activities and to ensure that excessive dust does not occur from construction sites.

2.2.5.4 Cultural Resources

Because the proposed project requires excavations along the riverbanks, where it is possible that deeply buried sites are present, archaeological and Native American monitors were present during all ground-disturbing activities along the banks of the river associated with the emergency repair and will be present for bridge retrofit.

2.2.5.5 Hazardous Materials and Hazardous Waste

Standard procedures ensuring that all equipment is maintained properly and free of leaks during operation, and all necessary repairs are carried out with proper spill containment, will minimize the risk of accidental spillage.

Hazardous materials will be procured through or be approved for use by Vandenberg AFB Hazmart to minimize waste. The contractor shall report their monthly usage of hazardous materials to the Hazmart to meet legal reporting requirements. Hazardous materials will be properly stored and managed in secured areas located outside the riparian corridor. Chemical stockpile spill containment, if necessary, will be

accomplished to minimize or preclude hazardous releases.

2.3 Dismissed Alternatives

2.3.1 Alternative C: Bridge Replacement

A fast-track bridge replacement was considered instead of retrofitting the existing structure. However, given the physical deficiencies of the bridge and the expected winter 2002-2003 storms, there is high risk of loss of the bridge prior to completing a design and securing necessary permits. This alternative was not pursued due to the urgency of the situation and funding availability within the time limitations. However, it is expected that a full bridge replacement will be designed, funded and completed within the next 5 years.

2.3.2 Alternative D – Additional Mid-span Bridge Supports

This alternative would consist of providing additional supports to the existing bridge structure at the middle of each span (distance between support structures). This concept would not ensure long-term access between North and South Vandenberg AFB remains uninterrupted or that mission-critical heavy payloads could be transported across the bridge for the following reasons:

- The existing pier foundations are too weak to accommodate the current loading. The additional mid-span supports would not correct the weaknesses at those locations.
- The pier walls need improvement that would not be accommodated by this concept.
- The additional mid-span supports would catch tremendous debris, over loading the structure.
- The debris dam caught on the additional piers would also adversely affect the river hydraulics, raising the river levels by causing a backwater condition.
- Additional supports could complicate the retrofit of the superstructure.

2.3.3 Alternative E – Rubber Tire Bank Protection

Rubber tire bank protection was considered because of its use of recycled products. Construction would consist of installing approximately 1,000 feet of bank protection in the form of rubber tires. The tires would be stacked at a batter forming a 2:1 slope, and would be tied together with wire rope and filled with rock and soil. The tires would be embedded into the toe of the riverbed, resulting in approximately 5,000 cubic yards of fill being placed along the northerly bank of the river.

Because this alternative requires fill to be placed along the riverbank, any native vegetation or habitat would be covered by this action. In addition, the protection provided by this alternative would only be as effective as the stability of each group of tires. This alternative was rejected over the proposed action because water would continue to flow against the tire system during each storm event and continue to cause a backwater condition at the bridge affecting its stability. Long-term access across the bridge between North and South Vandenberg AFB would be jeopardized and it may not be capable of supporting mission-critical heavy payloads. The pile retard system would be more effective in shifting the flow of the river away from the bank, where the piles would be located.

No other viable alternatives were identified that would provide for a shift in the river away from the bank.

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Chapter 3. Affected Environment

This chapter describes the existing environmental conditions at Vandenberg AFB, near and within the project area for the Proposed Action. The environmental components addressed in this section include relevant natural and human environments that are likely to be affected by the Proposed Action and the No-Action Alternative.

Vandenberg AFB is located in northwestern Santa Barbara County, where agriculture is the main economic and land use influencer. The base encompasses approximately 99,492 acres and is physically divided into North Vandenberg AFB and South Vandenberg AFB by the Santa Ynez River. Much of Vandenberg AFB is open space set aside as security or safety buffer zones for space launch activities. Approximately 25,000 acres of rangeland on the base are leased for cattle grazing.

The project area is located within the Lompoc Valley geomorphic region at the point where 13th Street on Vandenberg AFB crosses the lower reach of the Santa Ynez River, approximately three miles east of the Pacific Ocean. The Santa Ynez River floodplain comprises the Lompoc Valley. This area lies within the Santa Maria Basin-San Luis Range (SMBSLR) domain of central California, a geologic transition zone between the Transverse Ranges Geomorphic Province to the south and the Coast Ranges Geomorphic Province to the north. The associated riparian and wetland habitats of the Santa Ynez River are closely related to the adjacent transitional and upland habitats along the drainage. A coastal marsh habitat occurs near the mouth of the river, where it drains into the Pacific Ocean. The existing biological setting includes the regional setting of Vandenberg AFB, the specific project area setting, and past and present disturbances in and near the Santa Ynez River. Biological resources on Vandenberg AFB are abundant and diverse compared to other areas of California because Vandenberg AFB is within an ecological transition zone where the northern and southern ranges of many species overlap, and because the majority of the land within the base boundaries has remained undeveloped.

3.1 Biological Resources

The Santa Ynez River is the largest drainage basin of any stream on Vandenberg (Coulombe and Mahrdt 1976). This river originates in the San Rafael Mountains and flows along 70 miles through the communities of Solvang, Buellton and Lompoc before draining into a lagoon east of Ocean Beach. The Santa Ynez River has a drainage basin of 900 square miles. This river had perennial flow prior to the completion of Bradbury Dam in 1953. At the present, this is an intermittent river with highly fluctuating flow. Summer flow in the Santa Ynez River often drops to zero. Approximately 4 miles (6.4 kilometers) of the river runs through Vandenberg AFB. This segment generally has some water flowing as a result of discharge of irrigation water from agricultural fields and treated effluent from the Lompoc Regional Wastewater Treatment Plant, located east of Vandenberg's boundary (Coulombe and Mahrdt 1976).

3.1.1 Methodology

A literature search, general biological survey, special-status species survey, and wetland delineation, were used to characterize the biological resources upstream, downstream, and within the proposed project area.

The region of influence (ROI) considered in this EA for biological resources encompasses the Santa Ynez River and associated riparian corridor 0.25 miles upstream and 0.25 miles downstream of the 13th Street Bridge crossing over the Santa Ynez River. The project area (or construction limits) are defined as the Santa Ynez River and associated riparian corridor 900 feet upstream and 150 feet downstream of the 13th Street Bridge northerly abutment along the northern half of the riverbed and extending up to 450 feet towards the center of the riverbed (Figure 3-1).

Plant surveys, including special status plant surveys were conducted at the same time as the wetlands delineation, and encompassed the project area. Wildlife surveys consisting of visual and acoustic identification of species, and identification of tracks or other signs, were conducted within the ROI.

Project requirements necessitated the completion of the biological surveys in December 2002 and January 2003. Some plant species can only be definitively identified during their blooming periods in late spring or summer. Similarly, some wildlife species, such as Neotropical migratory birds, are only present in this region during the spring/summer months.

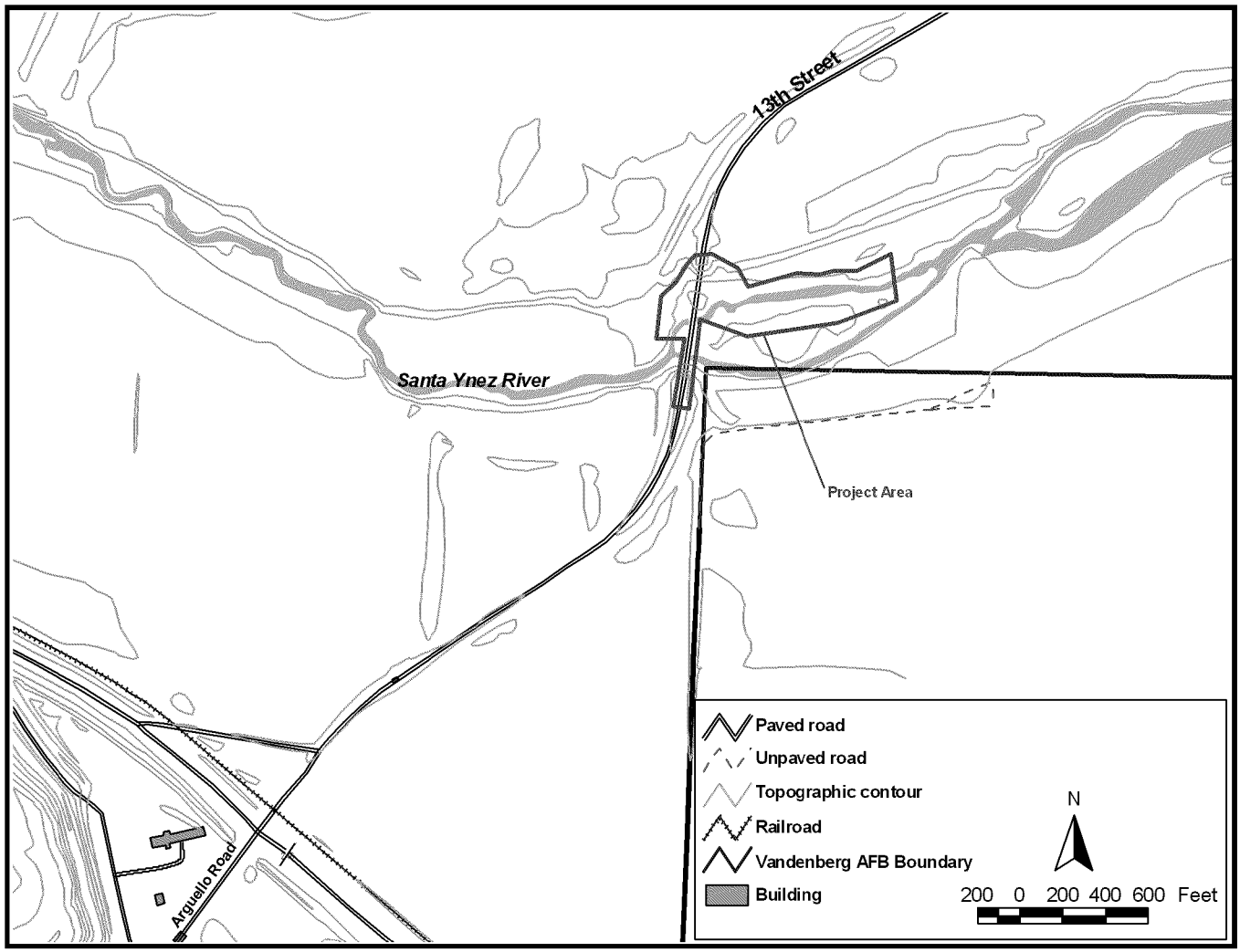

Figure 3-1. 13th Street Bridge project site.

Therefore, potential occurrence of special status and sensitive species not detected during the biological surveys was determined based on the presence of suitable habitat and/or known occurrence of the species. Sources used to determine potential for occurrence include:

- California Natural Diversity Data Base (CNDDB) files: CDFG 1999, 2001.
- Existing local and regional references: Ingles 1965; Munz 1974; Coulombe and Mahrdt 1976; McGinnis 1984; Stebbins 1985; Hickman 1993; Lehman 1994; Holland and Keil 1995; Oyler et al. 1995; USACHPPM 1995; Christopher 1996; Smith 1998; Holmgren and Collins 1999; Swift et al. 1997, Swift 2000; Pierson et al. 2002; USAF 2002.
- Other environmental documents prepared for projects in the area: USAF 2001.

Wetlands were delineated in accordance with the U.S. Army Corps of Engineers (USACE) methodology, which requires an area to meet specific criteria for each of three wetland parameters (vegetation, hydrology, and soils) in order to be considered a wetland. Using the routine method, transects were established at approximately 100-foot intervals across the proposed construction zone for the length of the construction corridor on the north bank of the Santa Ynez River, and within approximately 50 feet of either side of the 13th Street Bridge. Wetland delineation was performed at selected hydrophytic vegetation, wetland hydrology and hydric soils. USACE wetland delineation forms were completed at each soil test pit. The locations of soil test pits were documented using a Differential Global Positioning System (DGPS).

In addition to wetlands, the limits of jurisdictional waters of the U.S. were determined based on the characteristics of the banks of the river. Waters of the U.S. encompass the jurisdictional limits of the authority of the USACE and include streams and their tributaries that have defined bed and banks and/or that have an ordinary high water mark, which is a line on the shore established by the fluctuations of ordinary water flows, as well as adjacent jurisdictional wetlands (FR 33 CFR 320-330).

3.1.2 Affected Environment

3.1.2.1 Botanical Resources

Plant communities in the project area include Southern willow scrub, Coastal freshwater marsh, Central Coast Scrub, and ruderal. The native plant communities present in the area are described in more detail below. A complete list of plant species observed during the December 2002 surveys is provided in Appendix C. Plant species nomenclature follows Hickman (1993).

Large areas of the river channel have extensive sandbars that appear to have formed recently (i.e., within the last three to six years). The vegetative cover on these sandbars is low to moderate and includes many native and non-native, weedy, annual species commonly found in upland or wetland transitional habitats. Plant species on these sandbars include white sweet clover (*Melilotus alba*), telegraph weed (*Heterotheca grandiflora*), horseweed (*Conyza* spp.), cocklebur (*Xanthium strumarium*), and western ragweed (*Ambrosia psilostachya*). In addition to these annual species, patches of willows are also present within these recently deposited sandbars. Many willows appear to be resprouts from fallen trees or branches that have been washed downstream and buried (in some cases, the trunk of the parent tree is exposed) resulting in small stems originating from a central point in the soil. Others had evidently established from seed after flood events in recent years. All of the willows on the sandbars and the lower portions of the northern bank of the river, within the construction zone, appear to be young trees. None of the stems have a diameter at breast height (dbh) greater than four

inches, and most of the stems are less than one-inch dbh. In addition, the canopy of the willow scrub has not yet developed enough to intertwine making it difficult to penetrate. The southern bank of the river, however, supports a well-developed willow woodland on a high sandbar terrace within the river channel. This terrace is approximately five feet above the current active channel and, extended to the outer, southern bank of the Santa Ynez River. The willows on this terrace are large, with distinct main trunks and an interlocking canopy.

Southern Willow Scrub

This is the dominant community found in the Santa Ynez River riparian corridor in the vicinity of the 13th Street Bridge. It is composed of a variety of willow species including arroyo willow (*Salix lasiolepis*), red willow (*Salix laevigata*), and shining willow (*Salix lucida* ssp. *lasiandra*) of varying age classes. Sandbar willow (*Salix exigua*) is also present at scattered locations on the sandbars within the river channel, and in dryer areas of the site. Herbaceous species in the understory include stinging nettle (*Urtica dioica*), California blackberry (*Rubus ursinus*), nightshade (*Solanum* sp.), California figwort (*Scrophularia californica*), and mugwort (*Artemisia douglasiana*). Coyote brush (*Baccharis pilularis*), box elder (*Acer negundo*), and poison oak (*Toxicodendron diversilobum*) are present on the upper banks and are interspersed among the willows or are found in open areas where the willow canopy is lacking. Large patches of non-native tree tobacco (*Nicotiana glauca*) are present on the upper north bank of the river and in open, drier areas within the river channel.

Freshwater Marsh

The dominant plant species in the wetter areas with inundated or saturated soils include water cress (*Rorippa nasturtium-aquaticum*) and cattails (*Typha* spp.); these are generally found in monotypic stands. Other species present include brass buttons (*Cotula coronopifolia*), willow herb (*Epilobium* sp.), sticky baccharis (*Baccharis douglasii*), weedy cudweed (*Gnaphalium luteo-album*), and sneezeweed (*Helenium puberulum*). Within or adjacent to flowing water, less abundant species included iris leaved rush (*Juncus xiphioides*), umbrella sedge (*Cyperus eragrostis*), water weed (*Ludwigia peploides*), common monkey flower (*Mimulus guttatus*), water smartweed (*Polygonum lapathifolium*), and spikerush (*Eleocharis* sp.). One patch of giant reed (*Arundo donax*), an exotic species known to aggressively invade riparian habitats, was present adjacent to bridge pier 8, and was removed during the construction activities associated with the emergency repair.

Central Coast Scrub

Central Coast scrub is an upland plant community found distributed outside the Santa Ynez River floodplain in the 13th Street Bridge project area. It is often referred to as soft chaparral, but unlike chaparral, it contains species that are mesophyllous and shallow-rooted, and often are drought-deciduous and summer-dormant. Plant growth is concentrated in winter and spring, when soil moisture is readily available. Coastal sage scrub is a diverse vegetation type dominated by the shrub California sagebrush (*Artemisia californica*). In disturbed or more mesic areas, the dominant species may be coyote brush. Within the project area, and as a result of previous disturbances, coyote brush is overwhelmingly dominant. Other species found in this community within the project include poison oak, and black sage (*Salvia mellifera*).

3.1.2.2 Wildlife Resources

The Santa Ynez River is valuable to wildlife as a travel and migration corridor. The riparian corridor of the river allows wildlife from upland areas to avoid predators and escape human

disturbance, and it also provides food and water sources for these species.

Wildlife species detected during the field surveys for the 13th Street Bridge project are included in Appendix C. This table also includes wildlife species not encountered during the surveys but potentially present based on prior records in the vicinity. Surveys of invertebrate species were not done.

California red-legged frog (*Rana aurora draytonii*), Pacific treefrog (*Pseudacris regilla*) and ensatina (*Ensatina eschscholtzii*) are common amphibian species found in riparian areas at Vandenberg AFB. The California red-legged frog is federally listed as threatened.

Reptile species observed in riparian areas on Vandenberg AFB include western fence lizard (*Sceloporus occidentalis*), southern alligator lizard (*Elgaria multicarinata*), side-blotched lizard (*Uta stansburiana*), and western skink (*Eumeces skiltoninaus*). The southwestern pond turtle (*Clemmys marmorata pallida*), a federal species of concern, has also been observed at the Santa Ynez River near the 13th Street Bridge project area.

Fish species known to occur within the Santa Ynez River include tidewater goby (*Eucyclogobius newberryi*), mosquito fish (*Gambusia affinis*), Arroyo chub (*Gila orcuttii*), partially armored three-spine stickleback (*Gasterosteus aculeatus microcephalus*), fathead minnow (*Pimephales promelas*), and southern steelhead (*Oncorhynchus mykiss irideus*) (Coulombe and Mahrdt 1976; Swift 2002; Swift et al 1997). The tidewater goby and southern steelhead are federally endangered species.

More birds are found in riparian forests than in any other habitat type on Vandenberg. Coulombe and Cooper (1976) observed 46 species of birds in this habitat. The most abundant species was house finch (*Carpodacus mexicanus*). Year-round inhabitants include Bewick's wren (*Thryomanes bewickii*), spotted towhee (*Pipilo maculatus*) and downy woodpecker (*Picoides pubescens*). The federally endangered southwestern willow flycatcher (*Empidonax trailii extimus*) occurs in undisturbed riparian willow forest of the Santa Ynez River near the 13th Street Bridge. Cliff swallows (*Petrochelidon pyrrhonota*) nest underneath the deck structure of the 13th Street Bridge.

Large and medium mammal species commonly found in willow riparian forests include Virginia opossum (*Didelphis virginiana*), desert cottontail (*Sylvilagus audubonii*), brush rabbit (*Sylvilagus bachmani*), California ground squirrel (*Spermophilus beecheyi*), long-tailed weasel (*Mustela frenata*), coyote (*Canis latrans*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), and bobcat (*Felis rufus*). Small mammals include various species of mice (*Peromyscus* spp.), dusky-footed woodrat (*Neotoma fuscipes*), and Trowbridge's shrew (*Sorex trowbridgii*). Five bat species are known to roost underneath the existing 13th Street Bridge or in trees nearby (Pierson et al 2002). Three of these species, big brown bat (*Eptesicus fuscus*), Yuma myotis (*Myotis yumanensis*) and Mexican free-tailed bat (*Tadarida brasiliensis*), use the bridge as a maternity roost between April and August. The Yuma myotis is a federal species of concern.

3.1.2.3 Sensitive Habitats and Special-Status Species

Habitats and Plant Species

Sensitive plant communities recorded in the CNDDB (CDFG 1999, 2001) for the Surf 7.5 minute USGS quadrangles and which occur within the proposed project area include Southern Willow Scrub, Coastal Freshwater Marsh, and Southern California Steelhead Stream. No federal special-status plant species were observed during the field surveys

conducted in December 2002 (SAIC 2002). Table 3-1 provides a list of federal special-status plant species and other species of concern with potential for occurring within the project area based on previous botanical surveys conducted for other projects, the Integrated Natural Resources Management Plan (USAF 2003), and the CNDDB (CDFG 2001, 2002a).

Table 3-1. Federal special-status plant species and other species of concern with potential to occur in the vicinity of the proposed 13th Street Bridge project area.

Species	Status			Occurrence [4]	Habitat	Blooming Period
	USFWS[1]	CDFG[2]	CNPS[3]			
La Graciosa thistle *Cirsium loncholepis*	FE	ST	1B	P	Coastal dune swale wetlands, coastal salt marsh (brackish)	Jun-Aug
Black flowered figwort *Scrophularia atrata*	FSC		1B	P	Coastal sage scrub, chaparral	Apr-Jun

[1] FE=Federal Endangered Species; FSC=Federal Species of Concern.
[2] ST=State Threatened Species.
[3] California Native Plant Society (CNPS) 1B=plants rare, threatened, or endangered throughout their range (Skinner and Pavlik 1994).
[4] P=Potential.

La Graciosa Thistle (*Cirsium loncholepis*)
Federal Endangered Species/State Threatened Species/CNPS 1B

This species is endemic to areas on the margins of coastal wetlands in Southern San Luis Obispo county and northern Santa Barbara County. The proposed project area at the Santa Ynez River is within the historical range of this species. The last confirmed observation along the Santa Ynez River occurred in 1958 (Smith 1983).

The U.S. Fish and Wildlife Service published the proposed designation of critical habitat for La Graciosa thistle on November 15, 2001. Given that no plants have been located since 1958 within the historical range of this species along the Santa Ynez River on Vandenberg AFB, this area was not included in the critical habitat proposal.

Black-Flowered Figwort (*Scrophularia atrata*)
Federal Species of Concern/CNPS 1B

Black-flowered figwort is found from southern San Luis Obispo County to northern Santa Barbara County, and occurs in coastal scrub, chaparral, and woodlands in calcareous or diatomaceous soils, at elevations less than 500 meters. It is relatively common on the base in coastal scrub, riparian and oak woodlands, and in chaparral. This species was not found in the project area during the botanical surveys.

Wildlife Species

Table 3-2 lists federal special status wildlife species as well as other species of concern with the potential to be adversely affected by construction activities associated with the 13th Street Bridge emergency repair and temporary retrofit. Potential for adverse effects was determined based on their presence during the wildlife surveys conducted in December 2002 and January 2003, on past documentation of special status species within the vicinity of the proposed project area, and on suitability of habitat and occurrence within the region of a particular species.

Table 3-2. Federal special-status wildlife species and other species of concern with potential to be adversely affected by the proposed 13th Street Bridge project.

Species	Status		Occurrence
	USFWS[1]	CDFG[2]	
Amphibians			
California red-legged frog *Rana aurora draytonii*	FT	CSC	Observed
Reptiles			
Southern Pacific pond turtle *Clemmys marmorata pallida*	FSC	CSC	Observed
Fishes			
Southern steelhead *Oncorhynchus mykiss*	FE	CSC	Observed
Tidewater goby *Eucyclogobius newberryi*	FE	CSC	Observed
Arroyo chub *Gila orcutti*		CSC	Observed
Birds			
American bittern *Botarus lentiginosus*	FSC		Observed
Ferruginous hawk *Buteo regalis*	FSC (wintering)	CSC (wintering)	Observed
Northern harrier *Circus cyaneus*		CSC (nesting)	Observed – Nesting confirmed
Merlin *Falco columbarius*		CSC (wintering)	Expected
Allen's hummingbird *Selasphorus sasin*	FSC (nesting)		Observed - Potential for nesting
Pacific-slope flycatcher *Empidonax difficilis*	FSC (nesting)		Expected – Potential for nesting
Southwestern willow flycatcher *Empidonax traillii extimus*	FE	SE	Observed – Nesting confirmed
Loggerhead shrike *Lanius ludovicianus*	FSC (nesting)	CSC (nesting)	Observed – Potential for nesting
Horned lark *Eremophila alpestris*		CSC	Observed – Nesting confirmed
Yellow warbler *Dendroica petechia*		CSC (nesting)	Expected – Potential for nesting
California thrasher *Toxostoma redivivum*	FSC		Observed
Lawrence's goldfinch *Carduelis lawrencei*	FSC (nesting)		Expected – Potential for nesting
Mammals			
Pallid bat *Antrozous pallidus*		CSC	Expected – Historical records
Yuma myotis *Myotis yumanensis*	FSC		Observed – Maternity roost

[1] FE=Federal Endangered Species; FT=Federal Threatened Species; FSC=Federal Species of Concern.
[2] SE=State Endangered Species; ST=State Threatened Species; CSC=California Species of Concern.

Several special status species were excluded from this category because they either do not occur at the site during the time of construction activities, they do not breed within the site and their special status affords them protection during their breeding period, or they do not occur in the form that affords them special status protection (i.e., rookeries or nesting colonies). These species and their current status are listed in Appendix C – Biological

Resources, and include White-tailed kite (*Elanus leucurus*), Sharp-shinned hawk (*Accipiter striatus*), Cooper's hawk (*Accipiter cooperii*), Yellow-breasted chat (*Icteria virens*), and Tricolored blackbird (*Agelaius tricolor*).

In addition, although potential habitat exists within the project area for the Least Bell vireo, this species has been markedly absent over the last 10 years, and no nesting has ever been documented at this site (Holmgren & Collins 1999). Therefore, it is unlikely that this species would be encountered and is not expected to occur.

The following are brief species accounts of all special status species with potential to be adversely affected by the proposed project.

California red-legged frog (*Rana aurora draytonii*)
Federal Threatened Species/California Species of Concern

This highly aquatic amphibian inhabits quiet pools of streams, marshes, and occasionally ponds, where it prefers shorelines with extensive vegetation. It is active year-round in coastal areas, and can be found in upland areas during the winter and early spring. California red-legged frogs occur in nearly all permanent streams and ponds on Vandenberg AFB (Christopher 1996). Red-legged frogs are known to occur in the Santa Ynez River upstream and downstream of the 13th Street Bridge (Hunt 1990, Christopher 2002). A single California red-legged frog was found approximately 300 feet downstream of the bridge near the north bank in late October 2002 (S. Christopher personal communication to N. Francine, Vandenberg AFB), and several specimens were observed within the project area in December 2002 and January 2003 (SRS 2003b). The Santa Ynez River within the project area does not provide suitable habitat for breeding, which occurs from November to mid-April.

Critical habitat for the California red-legged frog was designated on March 13, 2001. However, Vandenberg AFB was excluded from final designation of critical habitat for the California red-legged frog because the base's Integrated Natural Resources Management Plan contains habitat protection measures for this species.

Southern Pacific pond turtle (*Clemmys marmorata pallida*)
Federal Species of Concern/California Species of Concern

This aquatic turtle is associated with permanent or nearly permanent water in a wide variety of habitat types including ponds, lakes, streams, irrigation ditches, or permanent pools along intermittent streams. Pond turtles require basking sites such as partially submerged logs, rocks, mats of floating vegetation, or open mud banks, from which they slip to underwater retreats at the approach of potential predators. They are mostly diurnal with some crepuscular and nocturnal activity. Egg-laying takes place April to August. This aquatic turtle has not been confirmed within the project area. However, this turtle has been documented upstream of 13th Street at the U.S. Federal Penitentiary wastewater pond (Christopher 1996), and suitable habitat exists within the Santa Ynez River riparian corridor and the project area for this turtle to occur.

Southern steelhead (*Oncorhynchus mykiss irideus*)
Federal Endangered Species/California Species of Concern

This anadromous fish species returns to freshwater streams to spawn. Unlike salmon, juvenile steelhead may reside in coastal streams from one to three years, and as adults may make the spawning journey more than once. The Santa Ynez River was historically a major spawning ground and nursery for steelhead and supported the largest steelhead run in Southern California (Romero 1993). Although runs have

decreased drastically since the completion of Gibraltar Dam in 1920 and Bradbury Dam in 1953, the Santa Ynez River still supports steelhead. The section of the river that occurs within the boundaries of Vandenberg AFB, including the project area, is presently used by steelhead for migration to and from spawning sites further upstream. Steelhead migrate upstream December through April. Downstream migration by smolts can occur any time of year.

Although the portion of the Santa Ynez River within Vandenberg does not provide potential breeding habitat for steelhead (i.e., deep pools, overhanging banks, spawning gravel), the waterway functions as a migratory corridor for this species.

Tidewater goby (*Eucyclogobius newberryi*)
Federal Endangered Species/California Species of Concern

The tidewater goby is a small bottom dweller of California's coastal estuaries, wetlands and lagoons, and lower reaches of coastal streams and rivers. It has been reported in all the major creeks on Vandenberg AFB—San Antonio, Canada Honda, and Shuman—as well as in the Santa Ynez River, and in both the Santa Ynez and San Antonio lagoons. This species has been recorded up to 7.5 miles upstream from the ocean in the Santa Ynez River (Swift et al 1997). The tidewater goby population in the Santa Ynez River is the largest on Vandenberg AFB but can fluctuate dramatically between years (Swift et al 1997). The tidewater goby breeds in the lagoon approximately three miles downstream from the project area. No breeding by tidewater gobies has been documented upstream of the Santa Ynez River lagoon (Swift et al 1997). Breeding occurs late April to early May followed by dispersal and migration to upstream locations.

Critical habitat for the tidewater goby was designated on November 20, 2000. Streams and drainages within Vandenberg AFB were not included in this designation.

Arroyo chub (*Gila orcutti*)
California Species of Concern

This small fish is native to southern California. It was introduced to creeks and rivers in the Central Coast in the 1930's and 1940's. The arroyo chub inhabits sandy and muddy bottoms in flowing pools and runs of headwaters creeks and small to medium rivers, and is often found in intermittent streams. The Santa Ynez River within the project area provides suitable habitat for this species, and the species was documented during field surveys (Swift 2002).

American bittern (*Botarus lentiginosus*)
Federal Species of Concern

This large, cryptically-colored heron is most often seen when flushed from marshes. American bitterns build platform nests of reeds and grasses in marshes near the water. The breeding period extends from April through August. American bitterns have decreased throughout Santa Barbara County as a result of loss of freshwater stands of bulrush and cattails and saltwater marshes (Lehman 1994). American bitterns occur along the Santa Ynez River corridor. They have been observed within the proposed project area (Holmgren & Collins 1999).

Ferruginous hawk (*Buteo regalis)*
Federal Species of Concern/California Species of Concern (wintering individuals)

This uncommon fall transient and winter visitor to Santa Barbara County is typically observed in coastal and interior grasslands, riparian woodlands, and agricultural fields. Ferruginous hawks have been sighted along the Santa Ynez River riparian corridor between 13th Street and Floradale Avenue (Holmgren & Collins 1999).

Northern harrier (*Circus cyaneus*)
California Species of Concern (nesting individuals)

Northern harriers are permanent residents of the northeastern plateau and coastal areas of California. Although harriers can be locally abundant where suitable habitat remains free of disturbance, especially from intensive agriculture, the California population has experienced a decrease over the last 50 years (CDFG 2002b). Destruction of wetland habitat, native grassland, and moist meadows, and burning and plowing of nesting areas during early stages of breeding cycle, are major reasons for the decline of the breeding population (Remsen 1978). Harriers breed April to September in shrubby vegetation, usually at marsh edge, where it builds nests on the ground. Northern harriers have been documented nesting in the vicinity of the 13th Street Bridge (Holmgren & Collins 1999).

Merlin (*Falco columbarius*)
California Species of Concern (wintering individuals)

Uncommon winter migrant in California from September to May. Frequents coastlines, open grasslands, savannahs, woodlands, lakes, wetlands, edges, and early successional stages. Numbers have declined markedly in California in recent decades. Merlins have been documented along the Santa Ynez River near the 13th Street Bridge (Holmgren & Collins 1999).

Allen's hummingbird (*Selasphorus sasin*)
Federal Species of Concern (nesting individuals)

Allen's hummingbird is a migratory bird that summers along the Pacific Coast of the United States from Oregon to southern California. This small hummingbird can be found in bushy woods, gardens, flower filled mountain meadows, and parks. The breeding season of this bird typically begins in February and can last through August. Although Allen's hummingbirds have not been documented in the Santa Ynez River riparian corridor near the 13th Street Bridge, they are likely to occur and potentially breed within the proposed project area.

Southwestern willow flycatcher (*Empidonax traillii extimus*)
Federal Endangered Species/California Endangered Species

This spring and summer resident of willow thickets in riparian habitats, is most numerous where extensive thickets of low, dense willows edge on wet meadows, ponds, or backwaters. The willow flycatcher arrives to breeding grounds in early May and departs in August after breeding has been completed. Willow flycatchers are known to occur in the Santa Ynez riparian corridor and have nested approximately 300 feet west of the 13th Street Bridge (Holmgren & Collins 1999).

Critical habitat for the Southwestern willow flycatcher was designated on July 22, 1997 (62 FR39129). The Santa Ynez River drainage and Vandenberg AFB was excluded from this designation.

Pacific-slope flycatcher (*Empidonax difficilis*)
Federal Species of Concern (nesting individuals)

This flycatcher is a widespread, fairly common summer resident in warm moist woodlands, including valley foothill and montane riparian, coastal and blue oak woodlands, and montane hardwood-conifer habitats. As a breeder, it is fairly common along riparian woodlands of north coastal Santa Barbara County. Breeding occurs mid-March to August. Although nesting has not been documented along the Santa Ynez River willow woodland near the 13th Street Bridge, breeding habitat is present and there is potential for this species to breed near or within the proposed project area.

Loggerhead shrike (*Lanius ludovicianus*)
Federal Species of Concern/California Species of Concern

This common resident and winter visitor in lowlands and foothills throughout California prefers open habitats with scattered shrubs, trees, posts, fences, utility lines, or other perches. It builds nests on stable branches of densely foliaged shrubs or trees. The breeding period extends from March through August. Shrikes are likely to occur near or in the vicinity of the 13th Street Bridge project area, and the coastal scrub adjacent to the project site offers potential breeding habitat to the species.

Horned lark (*Eremophila alpestris*)
California Species of Concern

Horned larks are common to abundant residents in a variety of open habitats, usually where trees and large shrubs are absent. In California they are found from grasslands along the coast and deserts near sea level to alpine dwarf-shrub habitat above treeline. Horned larks breed from March through July. They build cup-shaped grass-lined nests in depressions on the ground. Horned larks have been documented to breed in the vicinity of the 13th Street Bridge over the Santa Ynez River (Holmgren & Collins 1999).

Yellow warbler (*Dendroica petechia*)
California Species of Concern

This species is a summer resident in Santa Barbara County that breeds in riparian forests and woodlands from April through July. Although nesting yellow warblers are not confirmed within the project area, it is highly likely that they occur and breeding habitat exists upstream and downstream of the project site.

California thrasher (*Toxostoma redivivum*)
Federal Species of Concern

The California thrasher is endemic to coastal and foothill areas of California. Core habitat, in both coastal ranges and interior foothills, is chaparral. Within chaparral-dominated landscapes, California thrasher also inhabits riparian and oak woodland, especially where understory shrubs are dense. This species has an extended breeding season (January-July), with territorial activity intensifying with the start of the winter rains, usually in November. Most pairs raise two broods between February and June. This thrasher is fairly numerous in dense riparian areas and coastal sage scrub of Santa Barbara County. This species has been observed within the project area, and territorial activity by a pair of individuals was observed in late December 2002 (P. Nieto, pers. observation) within the proposed project area, indicating the potential for breeding in or near the project construction limits.

Lawrence's goldfinch (*Carduelis lawrencei*)
Federal Species of Concern (nesting individuals)

This goldfinch is highly erratic and localized in occurrence; they occur in a variety of open and semi-open habitats, including willow riparian, oak woodland and open coniferous forest. Lawrence's goldfinches build nests in dense foliage of a tree or shrub, including riparian thicket. The breeding season extends from April through September. Although nesting individuals have never been documented in the willow riparian of the Santa Ynez River near the 13th Street Bridge, nesting habitat does occur here and this species has the potential for breeding within or near the proposed project area.

Pallid bat (*Antrozous pallidus*)
California Species of Concern

The pallid bat is a locally common species of low elevations in California, where it is a yearlong resident. Its day roosts are in caves, crevices, mines, and occasionally in hollow trees and buildings. Night roosts may be in more open sites, such as porches and open buildings. Maternity colonies form in early April, and may have a dozen to 100 individuals. Although this bat species roosted historically at

the 13th Street Bridge, recent surveys did not document its presence there (Pierson et al 2002).

Yuma myotis (*Myotis yumanensis*)
Federal Species of Concern

Yuma myotis roost in buildings, mines, caves, or crevices, and is known to roost in abandoned swallow nests and under bridges. Maternity colonies of up to several thousand females and young may be found in buildings, caves, mines, and under bridges. Its distribution is closely tied to bodies of water, which are used as foraging sites and sources of drinking water. Like other California bats, this one mates in the fall and gives birth from late May to mid-July with a peak in early June. The 13th Street Bridge over the Santa Ynez River is a maternity roost for this bat species (Pierson et al 2002).

Bats have recently been the object of an in-depth study on Vandenberg AFB. This study (Pierson et al 2002) found that the 13th Street Bridge over the Santa Ynez River is an important roosting and maternity site for several bat species including big brown bat (*Eptesicus fuscus*), California myotis (*Myotis californicus*), Yuma myotis, and Mexican free-tailed bat (*Tadarida brasiliensis*).

3.1.2.4 Waters of the United States and Wetlands

Delineation of wetlands within the construction area for the proposed project was completed in December 2002 (SAIC 2002).

The present location and alignment of the main Santa Ynez River channel is the result of recent events. It is likely that the riverbed was substantially higher in elevation historically, and possibly as high as the sandbar terrace observed along the southern bank. However, the main channel of the river appears to be the result of downcutting, scour and soil deposition that have restricted the flow to its present alignment and location. One major point of evidence to support this is the undermining of the piers and the northern sheetpile bridge abutment, exposing steel pilings in the location of the main flow channel. Another observation is that the riparian vegetation on the north side of the river is younger and less developed than that on the south side, indicating recent and/or periodic disturbance. The sandbar accumulations and willow canopy features observed occur within the high banks of the Santa Ynez River, indicative of low and high flow events restricted to the area within these banks, and high flow events that inundated the higher sandbar terraces in the recent past. Thus, for these reasons, the Santa Ynez River (from high bank to high bank) meets the definition of waters of the U.S. and is subject to the jurisdiction of the USACE under Section 404 of the Clean Water Act.

Areas that currently meet the criteria for wetlands appear to be restricted to areas adjacent to flowing water in the Santa Ynez River and the tributary channel that originates at the edge of an existing agricultural field located southeast of the 13th Street Bridge. The entire proposed construction area is therefore subject to the jurisdiction of the USACE under Section 404 of the Clean Water Act.

The wetland plant communities found in the area are Southern willow scrub and freshwater marsh. These plant communities are described in Section 3.1.2 of this EA. A list of the plant species observed during the surveys and their WIS is provided in Appendix C.

For the wetland hydrology criterion to be met a site must be inundated or saturated or exhibit features that show the area was inundated or saturated for the required period of time (i.e., 45 days). Only the main channel of the river and a tributary channel had positive indicators of wetland hydrology. Water was flowing through both channels during the wetland delineation period (December 3-5, 2002). The tributary channel along the southern bank of the river, which was densely vegetated with willow forest, showed evidence of drift lines (i.e., deposition

of debris entangled in the above ground vegetation), a primary indicator of wetland hydrology (Environmental Laboratory 1987). Originating in adjacent agricultural fields, this channel enters the riverbed and follows along the base of the south bank of the river east of the bridge, and then joins the main flow channel west of the bridge.

A hydric soil is defined as "...a soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation (Environmental Laboratories 1987). Throughout the entire channel of the Santa Ynez River, and within the project area, the soils are primarily sandy, with some areas of gravelly soils, and a few isolated areas where finer soils, such as silts, loams and clays, have been deposited. In nearly all of the wetland delineation plots, positive indicators of hydric soils were observed. The most commonly observed indicator of hydric soils was a chroma of 2 in sandy soils. Soil determinations in wetland delineation plots on higher terraces and in drier areas of the sandbar along the north bank exhibited this feature as well. This may indicate that the soils were historically inundated or saturated.

There were several wetland delineation plots where finer soils (i.e., clay and silt) were present. These soil conditions were restricted to a dry backwater channel at the base of the northern bank and the tributary channel on the south side of the river. On the north side of the river, clay and silt layers had been deposited on top of the sandy soils that are more typical of the river. In some cases, the finer soils exhibited hydric soil features, and in other cases, the soils did not meet the criterion for a hydric soil. These channels, which are slightly lower in elevation than the adjacent sandbar, are likely inundated during periods of high flow and function as backwater areas. In addition, the topography suggests that once the flow recedes, these areas become isolated and the fine sediments are deposited in slow moving or ponded water as it percolates or evaporates.

3.1.2.5 Other Waters of the United States

Non-wetland waters of the U.S. were determined to be those areas within the highest banks of the river that did not clearly meet all three wetland criteria. These areas included unvegetated portions of flowing channels, vegetated and unvegetated portions of sandbar terraces located within the high banks of the Santa Ynez River, and backwater channels located along the north bank of the river in the upstream reaches of the construction area. This determination of other waters was also based on inconclusive evidence of the ordinary high water (OHW) mark within the river channel.

Due to changes in the bed elevation of the Santa Ynez River over time, the level of the OHW has changed. For example, there was evidence (water stained concrete on the northernmost bridge pier) that the OHW was previously approximately 7-10 feet higher than the present elevation of the thalweg. Over time, the bed elevation has dropped in the vicinity of the bridge and along the north bank of the river resulting in exposure of the sheetpile bridge abutment wall on the north bank and the northernmost pier. The sheetpile abutment wall was also water stained, suggesting that water was standing or flowing at a particular level for a period of time sufficient to result in the stain marks. However, on the sheetpile wall, the water stains were approximately 5 feet lower in elevation relative to the water stains on the northernmost pier, thus making it difficult to determine the OHW using this feature. Moreover, there was no clear or recent evidence along the earthen banks of the main channel of shelving, or drifted vegetation caused by flowing water that would have assisted in a determination of the OHW. In addition, the age class of willows on the sandbar on the north and

south sides of the river indicate that these areas are affected by flows in some years. Although the sandbars do not meet the hydrology and soil criteria for wetlands, they are located well within the high banks of the Santa Ynez River, are periodically affected by flood flows, and are thus considered waters of the U.S.

3.2 Water Resources

3.2.1 Affected Environment

Vandenberg AFB encompasses portions of two major drainage basins – San Antonio Creek and the Santa Ynez River. Aquifers capable of yielding large quantities of water usable for water supply are generally restricted to the deeper portions of these two waterways (USAF 1998).

The Santa Ynez River drains a total area of approximately 900 square miles, and the river flows westward discharging into the Pacific Ocean. Dams on the Santa Ynez River control its flow, and the volume of flow is also affected by irrigation withdrawals. Groundwater from the Santa Ynez River basin supplies water for irrigation, domestic, industrial, and municipal purposes through pumping.

The Santa Ynez River watershed consists of mostly undeveloped brushlands, rangelands, and agricultural fields. Flow in the Santa Ynez River is seasonal because of generally low precipitation from June to November. Higher discharges generally occur during the rainy season, from November to May. The long-term average precipitation in the area is 14 inches per year (USAF 2001). The portion of the Santa Ynez River that flows through Vandenberg AFB has year-round flow due to the discharge of treated effluent from the Lompoc Regional Wastewater Treatment Plant, which discharges a maximum of 3.5 million gallons per day to the river about five miles upstream from the 13th Street Bridge. High levels of total dissolved solids, sulfates, chlorides, and iron, cause water quality in the Santa Ynez River to be poor (USAF 2001).

3.2.1.1 Floodplain

The 100-year floodplain along the Santa Ynez River basin has been previously described (USAF 1994). Figure 3-2, illustrates the 100-year floodplain within the vicinity of the 13th Street Bridge.

3.2.1.2 Hydraulics

Data for the hydraulic analysis of the Santa Ynez River was obtained from the USGS Water Resources Data Report for California Water Year 2001 (1 October 2000 to 30 September 2001). The closest Santa Ynez River monitoring location to the 13th Street Bridge is located approximately six miles upstream of the bridge, 1,000 feet downstream of the H Street Bridge in Lompoc, California. The maximum mean flow was recorded in March at 2,983 cubic feet per second (cfs), and the minimum mean flow in July, August and September at 0.00 cfs (Table 3-3). The mean flow in the month of May was 41.5 cfs and in June it was 4.13 cfs. (USGS 2001.)

Table 3-3. Flow rates of the Santa Ynez River near Lompoc, California from October 2000 to September 2001.

Month	Total (cfs)	Mean (cfs)	Maximum (cfs)	Minimum (cfs)
October	201.22	6.49	33	0
November	131.90	4.40	12	1.5
December	115.50	3.73	7.3	1.3
January	1,761	56.80	312	3.7
February	4,524	162	666	21
March	92,469	2,983	31,900	121
April	6,158	205	377	84
May	1,285	41.5	157	16
June	124	4.13	15	0
July	0	0	0	0
August	0	0	0	0
September	0	0	0	0

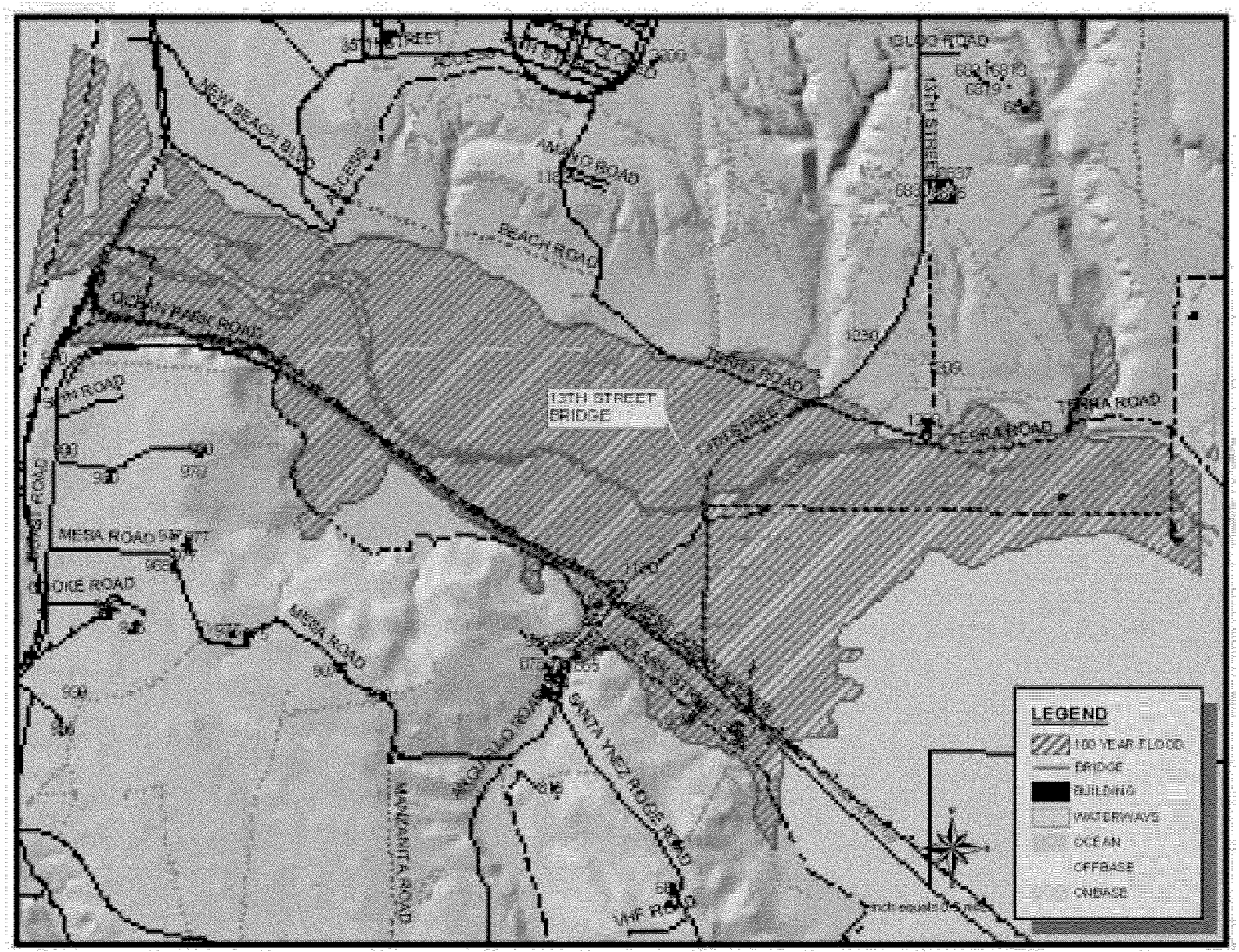

Figure 3-2. Santa Ynez River 100-year floodplain in the vicinity of the 13th Street Bridge.

3.2.1.3 Groundwater

The 13th Street Bridge area of the Santa Ynez River reach is within the lower region of the Lompoc Groundwater Basin, and is identified as the Lompoc Plain area. The Lompoc Groundwater Basin is located between the Purisima Hills to the north, the Santa Rita Hills to the west, and the Lompoc Hills to the south. The Basin has a net overdraft of 991 acre-feet per year (CSB 2000). The groundwater supplies water for irrigation, domestic, industrial and municipal purposes through pumping. Recharge to the aquifers beneath the Lompoc Plain includes infiltration from precipitation, seepage from streams, underflow from the aquifers in the Lompoc Terrace and Uplands, irrigation overflow, and by the Santa Ynez River through natural seepage (Stentson Engineering 2002). Near the coast of the Lompoc Plain, the aquifer has a shallow water-bearing zone of groundwater, with total dissolved solids (TSD) concentrations up to 8,000 milligrams per liter (mg/L), as measured in the late 1980s. The middle zones had measures of TDS concentrations from 700 to as high as 4,500 mg/L (SBCWA 2000). The depth of the groundwater varies from zero near the ocean to over 400 feet in the upland areas of this basin. For much of the Lompoc Plain area, the groundwater depth ranges from 15 to 50 feet (CSB 2002).

Groundwater is likely to be encountered during excavation activities needed to expose the pile caps and allow for the strengthening of foundations and pier walls. Dewatering would be required if groundwater is encountered during these activities. It is anticipated that excavations would not exceed 10 feet below the existing grade.

3.2.1.4 Sediment

Sediment load in the vicinity of the 13th Street Bridge is increased by agricultural runoff and during high flow periods. However, sediment load would be minimal at the time of project implementation (summer) due to the low flow expected to occur at that time. Disturbances to the riverbanks and riverbed by construction equipment would occur during implementation and may result in an increase in sediment load beyond that which would normally be expected.

3.2.1.5 Water Quality

The Central Coast Regional Water Quality Control Board (CCRWQCB) took measurements of several water quality parameters in the lower Santa Ynez River between January 2001 and March 2002. Water samples were taken at the 13th Street Bridge crossing over the Santa Ynez River on Vandenberg AFB, and at the Highway 246 crossing over the Santa Ynez River in Lompoc. Two parameters are identified as having the potential to be impacted by construction activities associated with the 13th Street Bridge emergency repair and retrofit project: Mean Total Suspended Solids (TSS) and Dissolved Oxygen (DO). Healthy creek systems can be expected to carry sediment loads during high flows; thus, TSS values will be elevated during storm events. Depressed oxygen levels typically are prevalent in summer and early fall when the temperatures are higher and water levels are low.

Mean TSS of 19 samples collected at the 13th Street Bridge between January 2001 and December 2002 was 271.1 mg/L. To compare values, at the Lompoc Highway 246 Bridge location, the mean TSS was 288.2 mg/L for the same time frame with 16 samples.

The mean for DO of 20 samples collected between January 2001 and September 2002 at the 13th Street Bridge was 8.7 mg/L. To compare values, the mean DO of 18 samples collected at the Lompoc Highway 246 Bridge location was 9.6 mg/L between January 2001 and March 2002.

Detailed results and additional data on water quality in the Santa Ynez River, from the 15-month monitoring period (January 2001-March 2002), is accessible through the CCRWQCB website at http://www.swrcb.ca.gov/rwqcb3/.

3.3 Air Quality

Air quality at a given location is described by the concentration of various pollutants in the atmosphere. These concentrations are expressed in units of part per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). The type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and prevailing meteorological conditions determine air quality. Comparing the concentration to state and/or federal ambient air quality standards determine the significance of a pollutant concentration. These standards represent the maximum allowable atmospheric concentration that may occur while still providing protection for public health and safety with a reasonable safety margin.

The Clean Air Act (CAA) required the U.S. EPA to establish ambient ceilings for certain criteria pollutants. Subsequently, the U.S. EPA promulgated regulations that set the National Ambient Air Quality Standards (NAAQS). NAAQS have been established for carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter 10 microns or less in diameter (PM_{10}), particulate matter 2.5 microns or less in diameter ($PM_{2.5}$), and sulfur dioxide (SO_2). Of these criteria pollutants, only ozone is a secondary pollutant and is classified as such because it is not directly emitted, but rather is formed from the reaction of NOx and reactive organic compounds (ROCs). The NAAQS are presented in Table 3-4.

Under the California Clean Air Act, California also established their own air quality standards, known as the California Ambient Air Quality Standards (CAAQS). CAAQS are generally more stringent than the NAAQS, and there are additional CAAQS for sulfates (SO_4), hydrogen sulfide (H_2S), vinyl chloride, and visibility-reducing particulate matter. The CAAQS are also presented in Table 3-4.

3.3.1 Affected Environment

The area affected by project emissions includes Vandenberg and the surrounding portions of Santa Barbara County. For carbon monoxide, nitrogen dioxide, PM_{10}, and sulfur dioxide, the affected area is generally limited to a few miles downwind of the emission source, while for ozone it can extend many miles downwind. Because the reaction between ROCs and nitrogen oxides usually occurs several hours after they are emitted, the maximum ozone level can be many miles from the source; therefore, the area affected by Vandenberg produced ozone and precursors could include most of northern Santa Barbara County. In addition, ozone and its precursors transported from other regions can combine with local emissions to produce high local ozone concentrations.

3.3.1.1 Regional Climate and Meteorology

The climate at Vandenberg can be characterized as cool and wet from November through April and warm and dry from May through October. The average annual rainfall is approximately 13.9 inches, most of which falls between November and May. Winds are usually light during the nighttime hours, reaching moderate speeds of approximately 12 miles per hour by the afternoon. Winds are most often northwesterly on North Base and north to northeasterly on South Base. The strongest winds are associated with rainy season storms.

Vandenberg AFB is subject to early morning and afternoon temperature inversions about 96 and 87 percent of the time, respectively. In an inversion, air temperature rises with increasing

Table 3-4. Ambient air quality standards.

Pollutant	Averaging Time	CAAQS[1,3]	NAAQS[2,3]	
			Primary[4]	Secondary[5]
Ozone	8-Hour	--	0.08 ppm [6] (157 µg/m^3)	Same as Primary
	1-Hour	0.09 ppm (180 µg/m^3)	0.12 ppm [6] (235 µg/m^3)	
Carbon Monoxide	8-Hour	9 ppm (10,000 µg/m^3)	9 ppm (10,000 µg/m^3)	--
	1-Hour	20 ppm (23,000 µg/m^3)	35 ppm (40,000 µg/m^3)	--
Nitrogen Dioxide	Annual Average	--	0.053 ppm (100 µg/m^3) (geo)	Same as primary (geo mean)
	1-Hour	0.25 ppm (470 µg/m^3)	--	--
Sulfur Dioxide	Annual Average	--	0.03 ppm (80 µg/m^3)	--
	24-Hour	0.04 ppm (105 µg/m^3)	0.14 ppm (365 µg/m^3)	--
	3-Hour	--	--	0.5 ppm (1300 µg/m^3)
	1-Hour	0.25 ppm (655 µg/m^3)	--	--
PM_{10}	Annual Mean (arith or geo)	20 µg/m^3 (geo)	50 µg/m^3 (arith)	Same as Primary (arith mean)
	24-Hour	50 µg/m^3	150 µg/m^3	Same as Primary
$PM_{2.5}$	Annual Arith Mean	12 µg/m^3	15 µg/m^3	Same as Primary
	24-Hour	--	65 µg/m^3	Same as Primary
Sulfates	24-Hour	25 µg/m^3	--	--
Lead	30-Day Average	1.5 µg/m^3	--	--
	Quarterly	--	1.5 µg/m^3	Same as Primary
Hydrogen Sulfide	1-Hour	0.03 ppm (42 µg/m^3)	--	--
Vinyl Chloride	24-Hour	0.010 ppm (26 µg/m^3)	--	--
Visibility Reducing Particles	1 Observation (8-hours between 8 AM - 6 PM PST)	In sufficient amount to produce extinction coefficient of 0.07 per kilometers due to particles when relative humidity <70%.	--	--

Notes:

1. California Standards for ozone, carbon monoxide, sulfur dioxide (1- & 24-hour), nitrogen dioxide, PM_{10}, $PM_{2.5}$ and visibility reducing particles are not to be exceeded. Sulfate, lead, hydrogen sulfide & vinyl chloride standards are not to be equaled or exceeded.
2. National Standards, (other than ozone, particulate matter, and those based upon annual averages or average arithmetic means) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest eight-hour concentration in a year, averaged over three-years, is equal to or less than the standard. For PM_{10}, the 24-hours standard is attained when 99% of the daily concentrations, averaged over three years, are equal to or less than the standard. For $PM_{2.5}$, the 24-hours standard is attained when 98% of the daily concentrations, averaged over three years, are equal to or less than the standard.
3. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature and pressure of 25 ^{o} C and 760-mm Hg, respectively. Most measurements of air quality are to be corrected the reference temperature of 25 ^{o} C and reference pressure of 760-mm Hg; ppm in this table refers to ppm by volume or micromoles of pollutant per mole of gas.
4. **National Primary Standards**: The level of air quality necessary, with an adequate margin of safety to protect the public health.
5. **National Secondary Standards**: The level of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.
6. U.S. EPA promulgated new Federal 8-hour Ozone and PM2.5 standard on July 18, 1997.

altitude, which confines the surface air and prevents it from rising. This restricts the vertical dispersion of pollutants thus increasing local pollutant concentrations. Pollutants are "trapped" under an inversion layer until solar radiation produces enough heat to lift the layer, or strong surface winds disperse the pollutants. In general, these conditions occur most frequently during the nighttime and early morning hours.

3.3.1.2 Existing Air Quality

The U.S. EPA classifies air quality within each air quality control region with regard to its attainment of federal NAAQS. The California Air Resources Board does the same for state CAAQS. An area with air quality better than state or federal ambient air quality standards for a specific pollutant is designated as attainment for that pollutant. Any area not meeting those standards is classified as non-attainment. Santa Barbara County is in attainment or unclassified for all the ambient air quality standards except for the state standard for PM_{10} and the federal and state O_3 standards. Currently, Santa Barbara County's air quality is classified as "serious" non-attainment for the federal O_3 standard, but the county has applied for redesignation as attainment in November 15, 2001 (Santa Barbara County Air Pollution Control Board 2001).

3.4 Cultural Resources

3.4.1 Cultural Setting

The following summary of prehistory and ethnohistory is modified from Lebow and Moratto (2001). The historic overview derives primarily from Palmer (1999).

3.4.1.1 Prehistory

The prehistory of California's central coast spans the entire Holocene and may extend back to late Pleistocene times. In the Santa Barbara Channel region, a fluted Clovis point found on the surface of a coastal site suggests use of the area possibly as early as 11,000–12,000 years ago (Erlandson *et al.* 1987), while a site on San Miguel Island has yielded a radiocarbon date of 10,300 B.P. (Erlandson 1991). Recent calibrations suggest that terminal Pleistocene radiocarbon dates are about 2,000 years too recent (Fiedel 1999:95) and thus these early sites may be even older. In San Luis Obispo County, excavations at CA-SLO-2 in Diablo Canyon revealed an occupation older than 9,000 years (Greenwood 1972; Moratto 1984) and investigations at CA-SLO-1797 indicate initial occupations as early as 10,300 B.P. (Fitzgerald 1998). Occupations on Vandenberg AFB occurred by at least 9,000 years ago, based on radiocarbon dates from CA-SBA-931 at the mouth of the Santa Ynez River (Glassow 1990, 1996).

Moratto (1984) refers to these early occupations as Paleocoastal. Population densities were probably low, judging from the limited number of sites dated to this period. Diagnostic tools associated with this time period have not been identified, although similarities with the San Dieguito Complex in southern California (Wallace 1978; Warren 1967) have been suggested (Erlandson 1994). Cultural assemblages have few of the grinding implements common to subsequent periods. These sites are characterized by a strong maritime orientation and an apparent reliance on shellfish. Occupants are thought to have lived in small groups that had a relatively egalitarian social organization and a forager-type land-use strategy (Erlandson 1994; Glassow 1996; Greenwood 1972; Moratto 1984).

Site densities throughout the central coast are higher during the subsequent periods, suggesting increased population size and possibly better site preservation. Sites dating between about 8,000 and 6,500 years ago often have relatively high densities of manos and

milling slabs that are typically associated with processing seeds. These milling stones are diagnostic of this period. Shellfish appear to have continued as a dietary staple throughout the central coast (Erlandson 1994; Glassow and Wilcoxon 1988), including Vandenberg AFB (Glassow 1996; Woodman *et al.* 1995). However, terrestrial mammals composed a larger portion of the diet on Vandenberg AFB during this period than during any other time (Glassow 1996; Rudolph 1991). Fish were a larger part of the diet than shellfish at Morro Bay in San Luis Obispo County, although shellfish were better represented during this period than during subsequent periods (Jones *et al.* 1994).

Early scholars associated sites of this age with inland knolls and terraces (e.g., Rogers 1929), but subsequent investigations revealed that coastal environments were also used (e.g., Glassow *et al.* 1988). Well-developed middens at many sites suggest a more sedentary and stable settlement system (Breschini *et al.* 1983). Glassow (1990, 1996) infers that occupants of Vandenberg AFB during this time were sedentary and had begun using a collector-type (i.e., logistically mobile) land-use strategy. Burial practices suggest that society was primarily egalitarian (Glassow 1996).

Population densities appear to have decreased substantially between 6500 and 5000 B.P. throughout the region, and little is known about this period. It is possible that arid conditions associated with the Altithermal degraded the environment to the point that only low population densities were possible (Glassow 1996; Glassow and Wilcoxon 1988).

After 5000 B.P., population densities increased to pre-6500 B.P. levels as conditions became cooler and moister. Between 5000 and 3000 B.P., mortars and pestles became increasingly common throughout the region, suggesting intensified use of acorns (Basgall 1987), although these implements may have been associated with processing pulpy roots or tubers (Glassow 1997). Along the Santa Barbara Channel coastline, use of shellfish declined as other animal foods became more important. Use of more diverse environmental settings is suggested (Erlandson 1997). On Vandenberg AFB, fish and sea mammals composed a larger part of the diet during this period. Large side-notched and stemmed projectile points became more prevalent in the archaeological record, presumably reflecting increased hunting, although Glassow (1996) suggests that proportions of terrestrial mammals do not surpass the pre-6500 B.P. levels. However, higher proportions of terrestrial mammals in archaeological assemblages are associated with this period in San Luis Obispo County. Increased logistical organization is suggested in this area (Jones *et al.* 1994; Jones and Waugh 1995). Proportions of obsidian (indicating exchange with other regions) increased after about 5000 B.P., particularly in San Luis Obispo County (Jones *et al.* 1994; Jones and Waugh 1995).

Cultural complexity appears to have increased around 3,000–2,500 B.P. Based on mortuary data from the Santa Barbara area, King (1981, 1990) suggests a substantial change in social organization and political complexity about 3,000 years ago. According to King, high-status positions became hereditary and individuals began to accumulate wealth and control exchange systems. Arnold (1991, 1992) proposes that this evolutionary step in socioeconomic complexity occurred around 700–800 years ago.

The period between 2,500 and 800 years ago is marked by increased cultural complexity and technological innovation. Fishing and sea mammal hunting became increasingly important, corresponding to development of the *tomol* (a plank canoe), single-piece shell fishhooks, and harpoons (Glassow 1996; King 1990). The bow and arrow also was introduced during this period (Glenn 1990, 1991). Sites in

San Luis Obispo County suggest that use of terrestrial mammals remained high. Proportions of imported obsidian continued to increase during this period (Jones *et al.* 1994).

Arnold (1992) proposes that the complex Chumash sociopolitical system known at historic contact evolved substantially during a brief period between A.D. 1150 and 1300, which she terms the Middle/Late Transitional Period. Arnold infers that decreased marine productivity caused by elevated sea-surface temperatures resulted in subsistence stress that allowed an elite population to control critical resources, labor, and key technologies, resulting in hierarchical social organization and a monetary system. Although the issue of elevated sea-surface temperatures has been questioned (e.g., Kennett 1998) and the inference of marine degradation and subsistence stress has been challenged (e.g., Raab *et al.* 1995; Raab and Larson 1997), the full emergence of Chumash cultural complexity around this time is generally accepted.

On Vandenberg AFB and in the Santa Barbara Channel region, population densities reached peak levels between 700 years ago and historic contact (Glassow 1990, 1996). Higher numbers of *Olivella* shell beads reflect increased exchange between the Channel Islands, the Santa Barbara mainland, and Vandenberg AFB. Increased subsistence diversity is apparent. Although shellfish continued to be a dietary staple in the Vandenberg area, the use of fish and birds increased, proportions of secondary species in shellfish assemblages increased (Glassow 1990), and dietary expansion is evident (Lebow and Harro 1998). Correspondingly, the range and diversity of site types increased as a greater range of habitats and resources was used (Glassow 1990; Lebow and Harro 1998; Woodman *et al.* 1991). In San Luis Obispo County, the settlement system appears to have changed substantially after 700 B.P. as residential bases along the coast were abandoned in favor of habitation sites farther inland. Coastal sites were used to obtain resources during short-term occupations (Breschini and Haversat 1988; Greenwood 1972; Jones *et al.* 1994; Jones and Waugh 1995). In addition, proportions of imported obsidian decreased substantially during this period (Jones *et al.* 1994).

3.4.1.2 Ethnohistory

People living in the Vandenberg AFB area prior to historic contact are grouped with the PurisimeZo Chumash (Greenwood 1978; King 1984; Landberg 1965), one of several linguistically related members of the Chumash culture. Blackburn (1975), Grant (1978a, 1978b, 1978c, 1978d), Greenwood (1978), Hudson *et al.* (1977), Hudson and Blackburn (1982, 1985, 1986), Hudson and Underhay (1978), Johnson (1988), and Landberg (1965) describe their social organization, traditions, cosmology, and material culture.

Accounts of early explorers in the Santa Barbara Channel area indicate that the Chumash people lived in large, densely populated villages with well-built structures (e.g., Bolton 1926, 1931; Engelhardt 1933; Fages 1937; Moriarity and Keistman 1968; Simpson 1939; Teggart 1911; Wagner 1929). With a total Chumash-speaking population estimated at 18,500 (Cook 1976) and employing a maritime economy, the Chumash had a culture that "was as elaborate as that of any hunter-gatherer society on earth" (Moratto 1984:118). Leadership was hereditary and chiefs exercised control over more than one village, reflecting a simple chiefdom social organization. The Chumash engaged in craft specialization and maintained exchange systems (Arnold 1992, Johnson 1988).

Relatively little is known about the Chumash in the Vandenberg region. Explorers noted that villages were smaller and lacked the formal structure found in the channel area (Greenwood 1978:520). The PurisimeZo Chumash at historic contact used approximately 22 villages,

with populations between 30 and 200 per village (Glassow 1996:13–14). King (1984:Figure 1) identified about five ethnohistoric villages on Vandenberg AFB, along with another five villages in the general vicinity.

Unfortunately, early explorers paid scant attention to Chumash subsistence and settlements systems. Using ethnohistoric, ethnographic, and archaeological data, Landberg (1965) attempted to reconstruct those facets of Chumash lifeways. Chumash subsistence relied primarily on fishing, hunting, and gathering plants (primarily acorns). In the spring, groups left their winter villages for temporary camps where they gathered grasses, roots, tubers, and bulbs. Hunting marine mammals became important during times when seals and sea lions congregated at their rookeries. Bulbs, roots, and tubers also were gathered during the summer months as well, and seeds became important during this season, especially to the people north of Point Concepción. Interior groups moved to the coast during the spring and summer to collect shellfish. Coastal groups returned to their villages in late summer and early fall to harvest large schooling fish such as tuna. Pine nuts were collected in the mountains during the fall months; acorns also were gathered in the late fall. Both of these resources, as well as berries collected during the late summer and early fall, were stored for use during the winter. Hunting also was important during the fall. Winter months were spent in villages, where residents relied primarily on stored foodstuffs as well as occasional fresh fish (Landberg 1965:102–104). Regional variation in subsistence strategies is evident in the ethnohistoric record (Landberg 1965:104–118); in the interior and along the northern coast of Chumash territory, marine resources were less important than acorns, seeds, and game (particularly deer).

Contact with early Euroamerican explorers, beginning with the maritime voyages of Cabrillo in A.D. 1542–1543, undoubtedly had an effect on the Chumash culture. The effect may have been profound. Erlandson and Bartoy (1995, 1996) and Preston (1996) convincingly argue that Old World diseases substantially impacted Chumash populations more than 200 years before Spanish occupation began in the 1770s.

Unquestionably, drastic changes to Chumash lifeways resulted from the Spanish occupation that began with the Portolá expedition in A.D. 1769. The first mission in Chumash territory was established in San Luis Obispo in 1772, followed in short order by San Buenaventura (1782), Santa Barbara (1786), and La Purísima Concepción, established in 1787 in the present location of Lompoc. The Santa Ynez Mission was established in 1804. Eventually, nearly the entire Chumash population was under the mission system (Grant 1978a). During the 1830s, the missions were secularized in an attempt to turn the mission centers into pueblos and make the Indians into Mexican citizens.

3.4.1.3 History

Vandenberg AFB history is divided into the Mission, Rancho, Anglo-Mexican, Americanization, Regional Culture, and Suburban periods (Palmer 1999). The Mission Period began with the early Spanish explorers and continued until 1820. Established in 1787, Mission La Purísima encompassed the area between Gaviota and Guadalupe. Farming and ranching were the primary economic activities at the Mission, which was responsible for supplying the Santa Barbara Presidio with food supplies. The Mission had 4,000 head of sheep by 1800; by 1812 they numbered 12,000. The number of cattle peaked at 23,546 in 1821. Missionaries had the Chumash weave wool blankets for the Santa Barbara Presidio. Approximately 14,000 head of livestock remained when the Mission closed in 1835. In addition to livestock, crops such as wheat, barley, corn, peas, and beans were grown at Mission La Purísima. Agricultural activities primarily occurred along the major streams such

as San Antonio Creek and the Santa Ynez River (Palmer 1999:1–7).

The Rancho Period of Vandenberg AFB history began in 1820 and continued until 1845 (Palmer 1999:7). Following secularization in 1834, the Alta California government granted former mission lands to Mexican citizens as ranchos. The 13th Street Bridge lies at the southern end of Rancho Jesus Maria, which originally encompassed 42,184 acres and was granted to Lucas, Antonio, and Jose Olivera in 1837. Rancho Jesus Maria included lands from just south of Shuman Canyon (northern boundary) to the Santa Ynez River (southern boundary), and from the Pacific Ocean to a few kilometers east of San Antonio Terrace and Burton Mesa on the east (Tetra Tech 1988). By 1839, Antonio and Jose Olivera had sold their part of the land grant to Jose Valenzuela, who, in 1847, sold a one-third share to Don Pedro Carrillo and a one-third share to Lewis T. Burton. Cattle ranching was the primary economic activity during the Rancho Period; in the 1840s cattle were so abundant that only the hides had any value. Fishing and trapping became important economic activities during this period (Palmer 1999:7–13).

The Bear Flag Revolt and the Mexican War marked the beginning of the Anglo-Mexican Period (1845–1880). Cattle ranching continued to flourish during the early part of this period, with as many as 500,000 cattle in Santa Barbara County during the 1850s. However, severe droughts during the 1860s decimated cattle herds and less than 5,000 cattle remained in the entire county. The combination of drought and change in government from Mexican to the United States caused substantial changes in land ownership. By 1851, non-Mexicans owned approximately 42 percent of the land grants; by 1864, after a few years of drought, 90 percent of the southern California ranchos were mortgaged. The various shares in Rancho Jesus Maria changed hands, with Lewis Burton steadily increasing his holdings until he owned the entire rancho in 1853. His son, Ben Burton, inherited all of Rancho Jesus Maria upon the death of Lewis in 1879. Sheep ranching and grain farming replaced the old rancho system during this period. By 1881, approximately 10,000 sheep grazed on Rancho Jesus Maria. Dairy farming became an important economic activity, particularly as Swiss-Italians immigrated into the area. Early roads were established during the 1860s and 1870s to obtain supplies that were surfed in at Point Sal. Although the amount of farming increased substantially, it still remained a limited activity due in large part to the difficulty of shipping to markets but also due to climatic fluctuations and lack of water. The Lompoc Temperance Colony established Lompoc during this period. Population growth and the associated demand for a means of sending and receiving supplies led to construction of the Lompoc Landing on Rancho Jesus Maria land donated by Lewis Burton. At one time, Lompoc Landing had a hotel, a restaurant, warehouses, and a machine shop (Palmer 1999:14–44).

Increased population densities characterize the Americanization Period (1880–1915). The railroad reached the area in the late 1890s, providing a more efficient means of shipping and receiving goods and supplies, which in turn increased economic activity. A branch line connected Lompoc with Surf in 1899. The wharf system was largely abandoned by 1901 as the railroad was completed between San Francisco and Los Angeles. Ranching continued and agriculture increased, particularly with development of steam-powered threshers. Row crops became increasingly common; sugar beets were one of the most economically important crops. Union Sugar Company established an operation in the San Antonio Creek valley and had a substantial influence on economic growth in the region. Dairy farming also increased, and the population of the Italian-Swiss ethnic community continued to grow. Oil exploration began in earnest during this period. Union Oil began to purchase Rancho Jesus

Maria property in 1903; they ultimately obtained subsurface rights to 120,000 acres in the area. Ben Burton leased the former Rancho Jesus Maria for grazing and farming during the early part of the Americanization Period. However, by 1900 the rancho was divided into four parcels and sold. These four parcels were further subdivided by 1906. Edwin Marshall formed the Jesus Maria Rancho Corporation in December of 1906; by the 1920s the Marshall Ranch encompassed 52,000 acres and prospered by raising cattle and beets. An elaborate system of line camps and other facilities supported the ranch operations (Palmer 1999:45–84).

Ranching and farming continued to dominate the area economy during the early part of The Period of Regional Culture (1915–1945). Cattle ranching reached its pinnacle during this period, particularly on the former Rancho Jesus Maria. Grain was raised on coastal terraces, and Union Sugar purchased farm land in the San Antonio Valley for agricultural purposes. The addition of paved roads greatly facilitated access to markets. However, dairy farming suffered as it became difficult to compete with the more profitable sugar beets and other row crops planted on the fertile valley bottoms. In 1933, the Marshall family moved to the Olivera adobe, and expanded and modernized the building. A wooden-framed guesthouse was added in 1935 and a dude operation known as Marshallia Ranch began. The ranch was sold to Frank Long upon the death of Edwin Marshall in 1937. All ranching, farming, and dairy farming in the Vandenberg AFB area was substantially reduced when Camp Cooke was established in 1941. This army training facility was built on approximately 90,000 acres along the coast, and included the area of Rancho Jesus Maria. At its peak, Camp Cooke included more than 36,000 personnel. Camp Cooke was deactivated at the end of World War II (Palmer 1999:85–117).

The Suburban Period (1945–1965) began with the end of World War II. After Camp Cooke was deactivated, the Army continued the historic tradition and leased much of the area for ranching and farming. Oil drilling reached its peak during this period. Union Oil drilled a number of wells on the San Antonio Terrace, and the Jesus Maria No. 4 produced commercial quantities of oil. Most of the Suburban Period is characterized by military use of the area. Camp Cooke was reactivated in 1950 for training during the Korean War, and the current landfill vicinity was used for grenade practice, range estimation, and bayonet practice. Camp Cooke was put into caretaker status from 1953 to 1956. The Cantonment Area became so overgrown that sheep were used to manage the vegetation and reduce the fire hazard. In November of 1956, the army transferred 64,000 acres of North Camp Cooke to the Air Force, and it was renamed the Cooke Air Force Base (Palmer 1999:118–125). In 1958 the base had its first missile launch, the Thor, and was renamed Vandenberg AFB. The southern section of the current base was transferred to the Air Force from Army and Navy control in 1964 (Vandenberg AFB 1992). Post-transfer use of both North and South Vandenberg AFB has related primarily to the construction and operation of missile launch and support facilities. Specific activities include management of the launch, testing, and evaluation of ballistic missile and space systems for the DOD, and operation of the Western Range (Science Applications International Corporation [SAIC] 1995; Vandenberg AFB 1992).

3.4.2 Affected Environment

An archaeological site record and literature search and a field survey were completed for the proposed project.

3.4.2.1 Archival Research

Archival research was completed at the Central Coast Information Center, University of California, Santa Barbara (CCIC-UCSB), and at 30th CES/CEVPC, Vandenberg AFB, California.

This effort included a review of literature, archaeological base maps, and cultural resource records. For each Alternative, information was collected for previous archaeological studies within 1.0 mile of the project's Area of Potential Effects (APE), and for archaeological sites within 0.25 miles of the APE. For the purpose of this project, the APE is defined as the entire riparian area from 900 feet upstream of the bridge to 200 feet downstream of the bridge. Maps consulted at 30th CES/CEVPC include Vandenberg AFB A-3 series (46 map set), the Base Comprehensive Plan (BCP) GIS, and USGS topographic maps. Maps resulting from Palmer's (1999) study of historic resources were also consulted. Earle and Johnson (1999) was consulted for information on areas of potential concern to Native Americans. USGS topographic maps with plotted site locations were consulted at UCSB.

Record Search Results

Archival research indicates that 37 cultural resource studies have been completed within 1.0 mile of the proposed project (Table 3-5). No archaeological sites are recorded within the APE and no archaeological sites are recorded within 0.25 mile of the APE. One unrecorded site, temporarily designated 'Pole 163', was recently discovered outside the APE but within 0.25 mile of the project.

Table 3-5. Archaeological studies within 1.0 mile of the proposed project.

Reference (in chronological order)	Vandenberg AFB Reference No.	UCSB Reference No.
Glassow 1977	1977-01	V-5
Spanne 1980	1980-07	V-207
WESTEC Services, Inc. 1981	1981-04	V-16
Neff 1982	1982-05	V-9
Colton 1983	1983-03	E-272
WESTEC Services, Inc. 1983	1985-03	
Westec 1984	1984-02	V-20
Erlandson 1984	1984-11	V-40
Greenwood and Foster 1984	1984-12	V-26
Gibson 1984	1984-21	V-41
Peterson et al. 1984	1984-31	E-282
Gibson and Osland 1985	1985-06	
Martin Marietta Corporation 1985	1985-09	
Gibson 1985a	1985-10	
King et al. 1985	1985-25	V-35
Gibson 1985b	1985-27	
Foster 1985	1985-28	V-190
Bowser et al. 1986	1986-02	
Gibson 1986	1986-14	
Gibson 1987	1987-09	
Berry 1988	1988-11	
Bergin and King 1989	1989-12	V-115
Gard et al. 1990	1990-10	
Osland 1990	1990-11	
Woodman et al. 1991	1991-06	
Peter and Dondero 1991	1991-07	E-1232b
Engineering Science 1994	1994-28	
Cagle1995	1995-05	
Haslouer and Kay 1996	1996-09	
McKim and Price 1996	1996-12	
Clark 1997	1997-01	V-159
Harro and Ryan 1997	1997-09	V-175
McDonnell Douglas Aerospace 1997	1997-22	n/a
Carbone and Mason	1998-03	
Denardo 1998		V-212
Lebow 2001	n/a	n/a
Davis et al. 2003	n/a	n/a

The site temporarily designated 'Pole 163' consists of a buried, low-density shell and lithic assemblage. The site is approximately 165 meters south of the APE/survey area, between Renwick Avenue and 13th Street on Vandenberg AFB. The deposit was recorded in July 2002 during monitoring of power pole installation. Five large marine shell fragments (Mytilus, Tegula) and one dark brown Monterey chert flake were observed within an intact layer of very dark grey to black, sandy clay loam. Approximately five feet of recent alluvium overlie the deposit and the dark clay loam appears to represent a buried surface. Cultural material was noted in two augers for anchor installation, both situated northeast of power pole 163, within a cultivated agricultural field adjacent to Renwick Road. No subsurface boundary testing has been conducted in this vicinity, and site boundaries remain unknown. A shell sample is being sent for radiocarbon date analysis. When completed, the site form will be submitted to the CCIC-UCSB for a permanent trinomial and the monitoring report and site form placed on file at the CCIC and 30CES/CEVPC.

3.4.2.2 Monitoring of Emergency Bridge Stabilization

In December 2002 and January 2003, Applied EarthWorks, Inc., (AE) monitored emergency stabilization of the northern portion of the 13th Street Bridge spanning the Santa Ynez River. Vegetation was cleared from the banks and slopes of the river along the northwest and northeast sides of the bridge. An area along 13th Street was cleared to allow for equipment staging. A previous access road passing under the northern portion of the bridge and up onto the northwest and northeast banks was reconfigured with heavy equipment. The northwest slope was reshaped using cut and fill, the fill consisting of native soils, vegetation, and imported shale. The northeast slope was reshaped primarily by cutting with an excavator to alleviate irregularities attributed to prior construction, such as buried asphalt and concrete. Trenching in the river bottom to create a channel temporarily diverted the course of the river. The new channel, lined with a 30-mil fiber shield, diverted the flow of water to the southern portion of the river, between the footings of piers 6 and 7, and allowed access to the underside of the northern portion of the bridge. Heavy equipment removed approximately 1-2 m of river sediment, vegetation, and debris from around pier footings 7, 8 and 9.

Along the northwest slope and bank, an area approximately 50 by 100 meters was cleared of vegetation and the slope was reshaped using cut and fill. Along the northeast slope and bank, an area approximately 30 by 70 meters was cleared of vegetation with an additional area 100 meters to the north, approximately 10 by 30 meters, cleared of vegetation; the slope was cut back one to two meters in an irregular area. The temporary channel was approximately 200 meters by three meters by two meters and was excavated from the northeast bank to the northwest bank in an arc that passed between the footings of piers 6 and 7.

Archaeological and Native American monitoring was conducted during the excavation activities described above. Monitoring was required by 30th CES/CEVPC due to the emergency and programmatic nature of the work, the broadly defined parameters for the locations of excavation, construction activities to be performed, and duration of the project. Following clearing of the vegetation on the northern banks and slopes, visibility was greater than 90 percent. In the riverbed, visibility was less than 40 percent due to the wetness of the sediment. No prehistoric or historic cultural materials were observed (Davis *et al.* 2003).

3.4.2.3 *Pedestrian Survey*

Archival research indicated that this portion of the Santa Ynez River floodplain was not previously surveyed for archaeological resources. AE conducted a pedestrian survey within the proposed project area in February of 2003. The northern riverbank was examined for about 900 feet upstream and 200 feet downstream from the existing bridge (Figure 3-3). Exposures along the riverbank were examined for evidence of buried archaeological sites. Beyond the previously excavated and recontoured area that was cleared in December 2002 and January 2003, visibility was excellent (over 70 percent) along downstream portion. Visibility was poor (less than 20 percent) along the upstream portion, and physical access to the riverbank was difficult. No prehistoric or historic cultural materials were observed during the survey.

3.5 Noise

Noise is often defined as unwanted sound that can interfere with normal activities or otherwise diminish the quality of the environment. Depending on the noise level, it has the potential to disrupt sleep, interfere with speech communication, or cause temporary or permanent changes in hearing sensitivity in humans and wildlife. Noise sources can be continuous (e.g., constant noise from traffic or air conditioning units) or transient (e.g., a jet overflight or an explosion) in nature. Noise sources also have a broad range of frequency content (pitch) and can be nondescript, such as noise from traffic or be specific and readily definable such as a whistle or a horn. The way the acoustic environment is perceived by a receptor (animal or person) is dependent on the receptor's hearing capabilities at the frequency of the noise and their perception of the noise. (URS, 1986)

One useful noise measurement in determining the effects of noise is the one-hour average sound level, abbreviated L_{eq1H}. The L_{eq1H} can be thought of in terms of *equivalent* sound; that is, if a L_{eq1H} is 45.3 decibels (dB), this is what would be measured if a sound measurement device were placed in a sound field of 45.3 dB for one hour. However, this is not what happens during real sound measurements. When a L_{eq1H} level of 45.3 dB is measured, the sound level has fluctuated above and below 45.3 dB, but the *average* during that hour is 45.3 dB. The L_{eq1H} is usually A-weighted unless specified otherwise. A-weighting is a standard filter used in acoustics that approximates human hearing and in some cases is the most appropriate weighting filter when investigating the impacts of noise on wildlife as well as humans. L_{eq} measurements can also be specified for other time periods such as eight or 24-hour periods.

Another useful noise measurement for describing noise is the maximum fast sound level, L_{max}. The L_{max} usually with A-weighting applied, is the greatest sound level reached during a sound event with a time weighting applied during the calculation. The time weighting causes the sound levels to be influenced by sounds that most recently occurred. The "fast" refers to specific exponential moving average time weighting with a time constant of 1/8 of a second. As this metric does not average the sound over a period of time like the L_{eq} measurements it is a good indicator of the loudest level the sound reaches.

According to regulations of the U.S. Occupational Safety and Health Administration (OSHA), employees should not be subjected to sound exceeding an L_{eq} of 90 dB for an 8 hour period. This sound level increases by 5 dB with each halving of time (eg. 4 hour period at 95 dB). Exposure up to a L_{eq} of 115 dB is permitted for a maximum of only 15 minutes during an 8-hour workday and no exposure above 115 dB is permitted (OSHA 1996). For

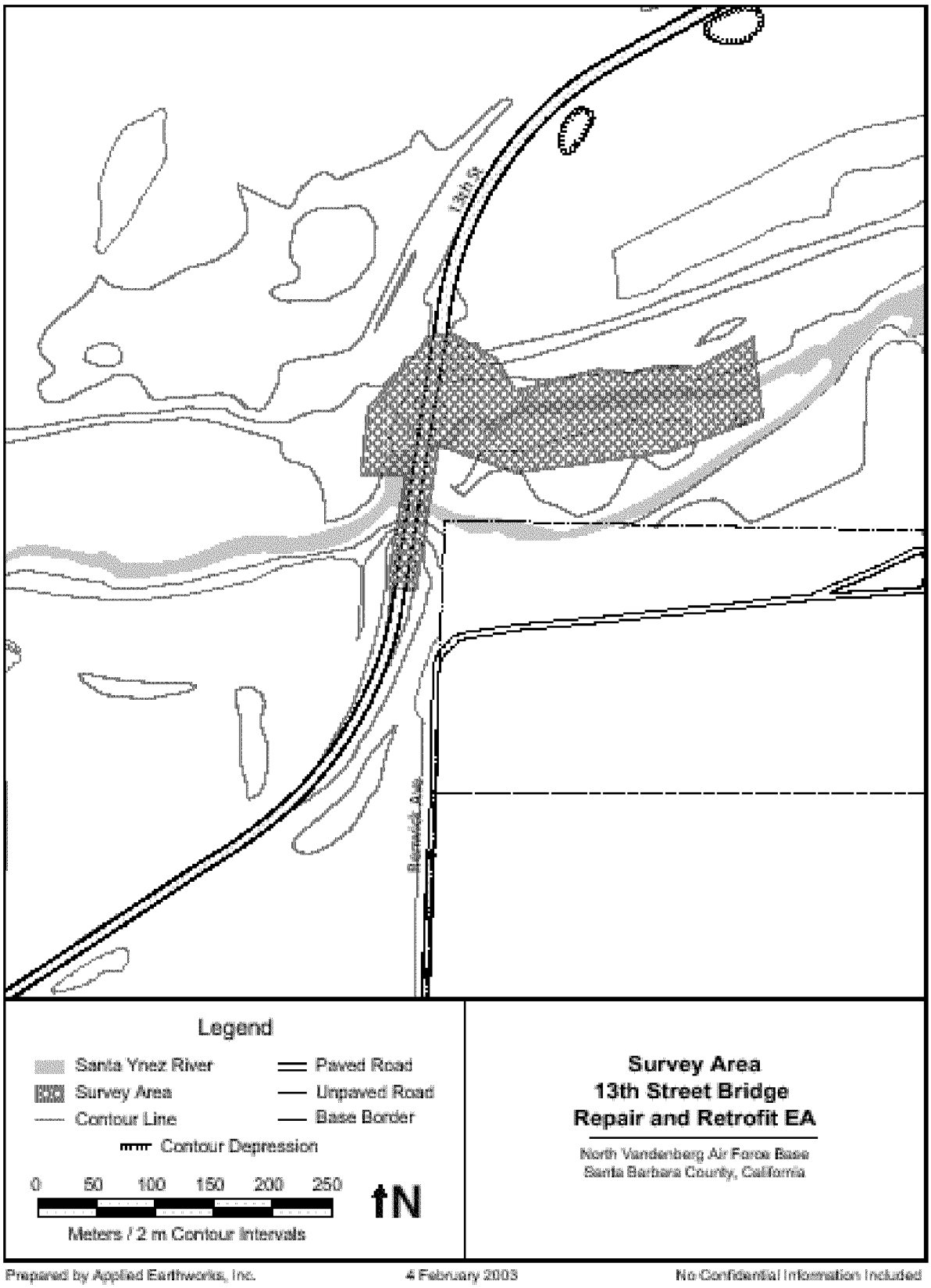

Figure 3-3. Survey area for cultural resources.

this analysis, OSHA standards are used as the "not to exceed" criteria as they are the most appropriate standards available, however for this document "employees" would refer instead to personnel working on or visiting Vandenberg that are not associated with Proposed Action construction or operational activities.

3.5.1 Affected Environment

The ROI for noise generated by construction activities related to the Proposed Action is the project area – i.e., the Santa Ynez River and associated riparian corridor 900 feet upstream and 150 feet downstream of the 13th Street Bridge northerly abutment along the northern half of the riverbed and extending up to 450 feet towards the center of the riverbed.

Ambient noise levels on Vandenberg AFB are generally quite low due to the large areas of undeveloped landscape and relatively sparse noise sources. Background noise levels are primarily driven by wind noise; however, louder noise levels can be found near industrial facilities and near transportation routes. Louder intermittent noise levels are created by rocket launches and aircraft overflights.

Ambient L_{eq1H} measurements on Vandenberg AFB have been found to range from 35 to 60 dB (SRS 2001). Typical sources of noise include automobiles, trucks, and trains, with the higher noise levels occurring near transportation routes and industrial facilities. Aircraft and helicopter flights and rocket launches are less-frequent transient sources of noise. The results of launch noise measurements from eight different launch vehicles for 20 individual launches from Vandenberg AFB (SRS 2001), indicate that launches generate SEL measurements ranging from 72.4 to 125.6 dB, depending on the launch vehicle.

3.6 Earth Resources

3.6.1 Geology and Soils

Vandenberg AFB is a geologically complex area that includes the transition zone between the Southern Coast Range and Western Transverse Range geomorphic provinces of California. The geologic features of Vandenberg AFB have been an important factor in the development of the diverse natural habitats found in this primarily undeveloped stretch of California coastline. Vandenberg AFB is underlain predominantly by marine sedimentary rocks of Late Mesozoic age (140 to 70 million years before the present) and Cenozoic age (70 million years to the present). The basal unit underlying the entire base is the Franciscan Formation of upper Jurassic age (Dibblee 1950). The Franciscan Formation consists of a series of sedimentary and volcanic rocks with numerous serpentine intrusions. Extensive folding and faulting throughout the Vandenberg AFB area has created four structural regions: the Santa Ynez range, the Lompoc lowland, the Los Alamos syncline, and the San Rafael Mountain uplift (Reynolds et al. 1985). The Santa Ynez range consists of a very thick Cretaceous-Tertiary sedimentary section uplifted along the Santa Ynez fault; it was then subsequently folded. The Lompoc lowland is an area of low relief that is structurally synclinal but has Franciscan basement relatively close to the surface. The Los Alamos syncline is a deep structural down warp traversing the Los Alamos and upper Santa Ynez valleys. Faulting along the southwestern margin of the mountain range uplifted the San Rafael Mountains. The majority of the folds in these structural regions are oriented to the northwest.

The two major riparian environments in the east/west trending valleys of Vandenberg AFB are the San Antonio Creek and the Santa Ynez River. The area encompassing the Santa Ynez River is referred to as the Lompoc Valley geomorphic area. The Lompoc valley is a broad

synclinal valley occupied in part by the floodplain of the Santa Ynez River. A Sorrento-Mocho-Camarillo soil association, as are all river and creek areas on Vandenberg AFB, characterizes the river area. This soil type is found in nearly level to moderately sloping terrain such as floodplains and alluvial fans. The soil is well drained to somewhat poorly drained, and it ranges from sandy loams to silty clay loams (Shipman 1981). This soil type is composed of 40 percent Sorrento soils, 30 percent Mocho soils, 10 percent Camarillo soils, and 20 percent other soil series. The Sorrento series consists of well-drained sandy loams to clay loams, which are recent fluvial or alluvial deposits and have a high to very high fertility. The erosion hazard is none to slight for Sorrento sandy loams and slight to moderate for Sorrento loams. The Sorrento series has a low to moderate shrink-swell potential. The Mocho series consists of well-drained alluvial and silty loams with a moderate to high fertility. It has a low to moderate shrink-swell potential and its erosion factor is none to slight. The Camarillo series consists of poorly drained, very fine-grained sandy loams to silty clay loams, which are alluvial in origin and have eroded from sandstone and shale bedrock. The fertility for the Camarillo series is moderate to high, there is no erosion hazard, and it has a low to moderate shrink-swell potential (Shipman 1972).

3.6.2 Seismology

The Santa Barbara County region is seismically active with a major earthquake occurring in the region about every 15 to 20 years (USAF 1987, Alterman et al 1994). The Santa Ynez-Pacifico Fault Zone, the Lompoc-Solvang (Santa Ynez River)-Honda Fault Zone, the Lions Head-Los Alamos-Baseline Fault Zones, and their potential offshore extensions, are three of the primary fault zones that project through Vandenberg AFB (Alterman et al 1994).

These fault systems within the Transverse Ranges are considered active (Jennings 1994) and capable of generating damaging earthquakes. Moderate or major earthquakes along these systems could generate strong or intense ground motions in the area, and possibly result in surface ruptures of unmapped faults along the northern and southern boundaries, as well as the central part of Vandenberg AFB.

3.6.3 Geological Hazards

The ROI considered for purposes of this EA is Santa Barbara County. The proposed project site at the 13th Street Bridge over the Santa Ynez River is located in a seismically active portion of Central California. Potential hazards that could affect the site and result in structural damage include faulting, ground shaking, liquefaction, lateral spreading and flooding. The hazards consist of seismically induced settlement, collapse (hydroconsolidation), and tsunami potential.

The potential for surface fault rupture on Vandenberg AFB is generally considred to be low (USAF 1987). At the present, there are no known areas where liquefaction has occurred. Areas most prone to liquefaction are those in which there is sandy to silty soil, the water table is within 50 ft of the surface, and earthquake loading exceeds 20 percent of gravity. The areas most prone to liquefaction on Vandenberg AFB are near San Antonio Creek and the Santa Ynez River. The potential for liquefaction on Vandenberg AFB, despite these areas, is still considered low (USAF 1987).

Tsunamis, sea waves associated with offshore earthquakes, along the Central and Southern California coast have not been well recorded and documented until recently. Since 1946, only five significant tsunamis have been recorded, and each was associated with distant earthquakes. Tsunami flooding of the Vandenberg AFB coastline could occur in low-lying areas such as the mouth of the Santa Ynez River. The recurrence intervals for tsunamis

have not been predicted for the Vandenberg AFB coastline (USAF 1978).

3.7 Land Use

3.7.1 Regional Setting

Vandenberg AFB covers approximately 99,492 acres in Santa Barbara County and is divided into, North Vandenberg AFB and South Vandenberg AFB by the Santa Ynez River and Highway 246, a public thoroughfare. Much of Vandenberg AFB is open space set aside for security and safety buffer zones. Vandenberg AFB accommodates agricultural outleasing as a major land use on base. At present, 23,500 acres of rangeland are permitted for grazing activities, supporting a maximum of 800 head of cattle, and 1,104 acres are dryland farmed. All grazing land and farmland at Vandenberg AFB is used by the U.S. Department of Justice, Bureau of Prisons, U.S. Penitentiary in Lompoc for livestock grazing and 1,104 acres for dryland farming (USAF 2002).

Facilities for space launches, missile tests, telemetry and tracking, are scattered throughout the base. North Vandenberg AFB includes the urbanized main administrative area, which includes various administrative, training, industrial, commercial, missile test launch sites, tracking facilities, and residential land uses. South Vandenberg AFB supports space launch, telemetry, and tracking facilities. All of these facilities support the primary mission of Vandenberg AFB. The 30th Civil Engineering Squadron, Base Planning (30th CES/CECB) manage development and land use at Vandenberg AFB. The primary document that outlines development goals and constraints is the Vandenberg Air Force Base General Plan.

Land use areas on both North and South Vandenberg AFB include recreational use of beaches by the public and/or military. Immediately east of these recreational beach areas is open land set aside for security and safety buffer zones as described above.

A Union Pacific rail line passes through Vandenberg AFB near the coast. It serves as the main line for Los Angeles to San Francisco coastal rail transportation, providing freight service to most cities along the coast. A number of spur lines operate off the main line in the Vandenberg AFB area to provide local freight delivery. AMTRAK passenger service from Seattle to San Diego, share these Union Pacific Railroad lines (USAF 1988). An unmanned AMTRAK station is located adjacent to Surf Beach, at the west end of Highway 246.

13th Street is the main access route between North and South Vandenberg AFB. Therefore, the bridge over the Santa Ynez River serves as an important thoroughfare for employees on base and is essential to accomplish mission related activities.

3.7.2 Project Area Setting

The ROI for land use purposes in this EA encompasses the immediate project area, and the temporary construction staging areas on either side of 13th Street and adjacent to the northern approach to the bridge.

The area near the 13th Street Bridge project site is characterized by open space. Dryland farming and cattle grazing occurs to the north, east and west of 13th Street and south of Terra Road, and dryland farming to the south of the project area, east and west of 13th Street and north of West Ocean Avenue (Hwy 246). Wildlife viewing areas are located at the Santa Ynez River lagoon and at the Waterfowl Natural Resources Area south of Terra Road and west of 13th Street. Figure 3-4 indicates the location of these various areas as well as that of building facilities within one mile of the project area.

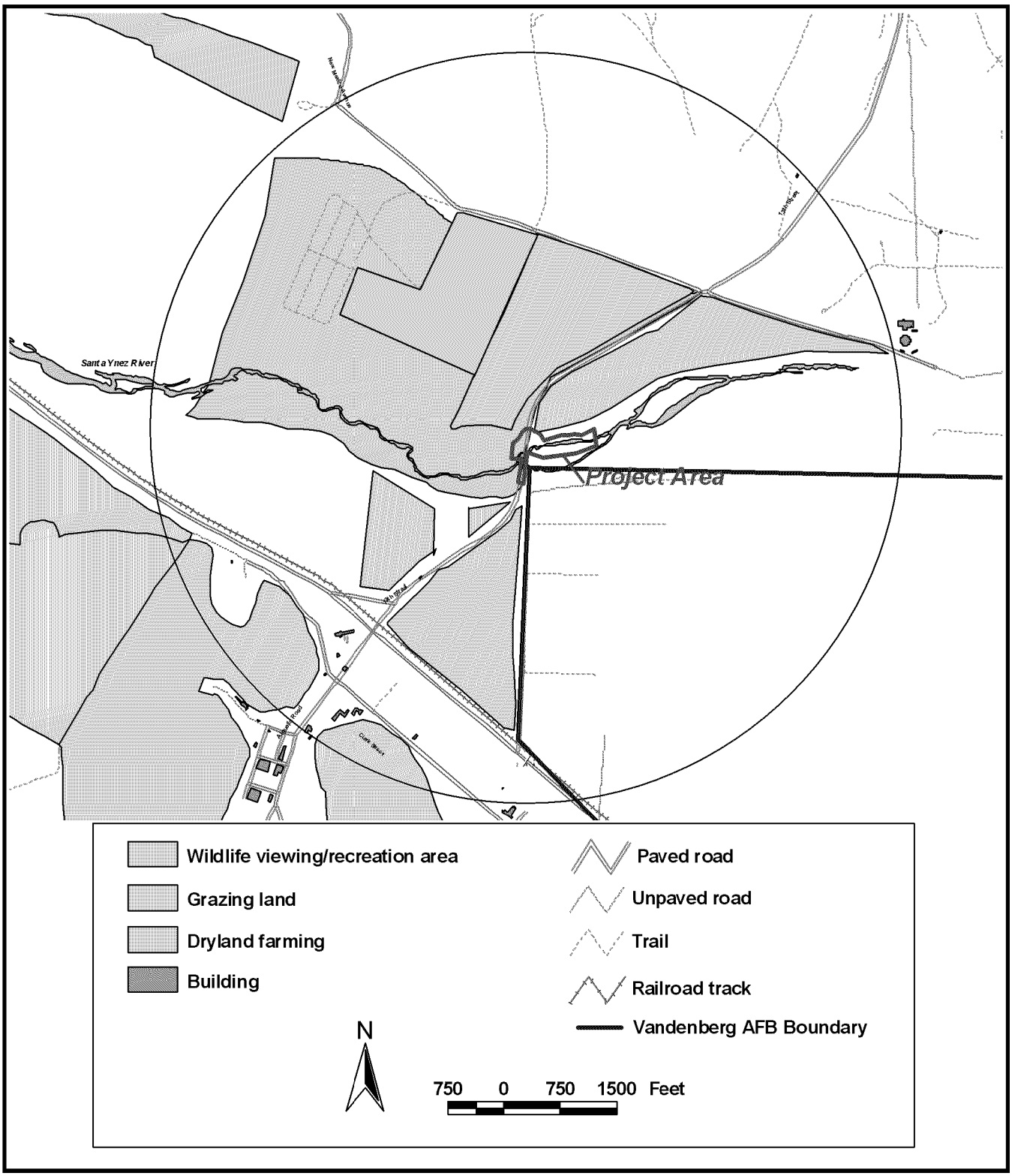

Figure 3-4. Land use within a one mile radius of the project area.

3.8 Human Health and Safety

All construction activities and facility operations and maintenance on Vandenberg AFB are subject to the requirements of the federal Occupational Health and Safety Act (OSHA), Air Force Occupational Safety and Health (AFOSH) regulations.

Relevant health and safety requirements include industrial hygiene and ground safety. Industrial hygiene is the joint responsibility of Bioenvironmental Engineering, 30th Space Wing (30th SW) Safety, and contractor safety departments. Responsibilities include monitoring of exposure to workplace chemicals and physical hazards, hearing and respiratory protection, medical monitoring of workers subject to chemical exposures, and oversight of all hazardous or potentially hazardous operations. Ground safety is the responsibility of 30th SW Safety and includes protection from hazardous situations and hazardous materials.

Many areas on Vandenberg AFB were used as ordnance training ranges in the past. As a result, there are remnants of unexploded ordnance (UXO) in recognized areas of the base. Only a slight movement may detonate UXO from these areas, resulting in an explosion, burning, or release of smoke. Special precautions need to be taken in known areas of Vandenberg AFB that were used as practice ranges for artillery firing, referred to as Explosive Ordnance Disposal (EOD) Zones.

The affected environment for Health and Safety is the regulatory environment for health and safety issues established to minimize or eliminate potential risk to the general public and personnel involved in the retrofit construction project.

3.9 Hazardous Materials and Hazardous Waste

Hazardous materials and waste include substances that, because of their quantity, concentration, physical, chemical, or infectious characteristics, can present substantial danger to public health and welfare or to the environment when released into the environment. These substances are defined as hazardous by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (42 USC 9601-9675), the Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act (RCRA) (42 USC 6901-6992), and Title 22 of the California Code of Regulations (CCR). Executive Order 12088, under the authority of U.S. Environmental Protection Agency (EPA), ensures that necessary actions are taken for the prevention, management, and abatement of environmental pollution from hazardous materials or hazardous waste caused by federal facility activities.

3.9.1 Hazardous Materials Management

Vandenberg AFB uses hazardous materials for its missions and mission support activities. In addition to complying with federal and state regulations, all operators on Vandenberg AFB must comply with 30th SW Plan 32-7086 *Hazardous Materials Management*. All hazardous materials brought onto Vandenberg AFB must be approved and coordinated through the Base Hazardous Materials Pharmacy (Hazmart). Hazardous materials management also requires compliance with California Business Plan regulations (California Health and Safety Code 6.95). Inspections by base and Santa Barbara County officials verify compliance with hazardous materials requirements.

3.9.2 Hazardous Waste Management

Vandenberg AFB generated approximately 656 tons of hazardous waste in the year 2000

(Vandenberg AFB 2001). Currently, Vandenberg AFB operates "satellite" and less than 90-day accumulation points. Hazardous waste is manifested and shipped off-site for final disposal by a Defense Logistic Agency approved contractor (30th SW Plan 32-7043A, *Hazardous Waste Management*, February 2001).

The Vandenberg AFB Hazardous Waste Management Plan (HWMP) outlines the procedures to be followed for hazardous waste management and disposal. Implementation of the Hazmart and other Pollution Prevention Program components will continue to reduce hazardous wastes generated on base.

3.9.3 Installation Restoration Program

The federal Installation Restoration Program (IRP) was implemented at Department of Defense (DOD) facilities to identify, characterize, and restore hazardous substance release sites. There are currently 136 IRP sites throughout Vandenberg AFB grouped into six Operable Units based on similarity of their characteristics. The IRP sites are remediated through the Federal Facilities Site Remediation Agreement, a working agreement between the Air Force, the Regional Water Quality Control Board – Central Region, and the Department of Toxic Substances Control. In addition to IRP sites, there are identified Areas of Concern (AOC), where potential hazardous material releases are suspected; and Areas of Interest (AOI), defined as areas with the potential for use and/or presence of a hazardous substance.

The following criteria were used to determine the sites included in this discussion:

- IRP sites, AOCs, and AOIs within 2,000 feet of the project site;
- Sites containing surface water drainage or groundwater flow within the Santa Ynez River watershed; and
- Sites upstream of the project site.

No IRP sites, AOCs or AOIs have been identified within 2,000 feet of the 13th Street Bridge over the Santa Ynez River.

3.9.4 Hazardous Materials and Waste Transport

The Department of Transportation (DOT) regulates the transport of hazardous materials and waste. Anyone transporting hazardous materials or waste must obtain U.S. EPA identification numbers as transporters. The U.S. EPA has incorporated DOT regulations (49 USC) into its regulatory scheme, and has added other requirements such as record keeping and cleanup of spills. Transporters of hazardous materials and waste at Vandenberg AFB are regulated by the aforementioned laws and are DOT certified transporters. Vandenberg AFB follows the Caltrans requirements for traveling with hazardous materials on State Highway 1, which runs through part of the eastern edge of Vandenberg AFB, and State Highway 246, which physically divides the base into North and South Vandenberg AFB.

3.10 Solid Waste

The Vandenberg AFB Class III landfill occupies approximately 172 acres and operates pursuant to Solid Waste Facility Permit #42-AA-0012 issued to the Air Force on January 10, 2000, by the Santa Barbara County Environmental Health Services Department; and pursuant to Waste Discharge Requirement Order No. 94-26 issued on June 3, 1994, by the California Regional Water Quality Control Board. The landfill accepts solid waste from base residences, on-base organizations and the U.S. Federal Penitentiary in Lompoc. This permit allows the Vandenberg AFB landfill to accept a daily maximum of 400 tons of waste. The average daily volume of solid waste received at the landfill is 30 to 60 tons.

3.10.1 Affected Environment

Under the Proposed Action, approximately 1,915 cubic yards of soil would be excavated to complete the stabilization and retrofit repairs to the 13th Street Bridge. While most of this material will be relocated on the site by spreading and filling, excess materials would be transported to a designated waste or fill site.

Construction debris, along with green waste, used tires and other recyclable materials, will be segregated and diverted for reclamation. Construction contract specifications may not allow contractors to dispose of construction debris in the landfill. Any wastes resulting from the Proposed Action that are not authorized to be disposed of in the Vandenberg AFB landfill will be segregated and taken off base for recycling or disposal.

3.11 Pollution Prevention

The Pollution Prevention Act (PPA) was enacted in 1990 to refocus the national approach to environmental protection. The PPA has turned the focus of environmental protection toward pollution prevention (P2), which emphasizes source reduction and recycling to reduce impacts to all media. The Air Force has developed a P2 Program to implement the requirements of the Resource Conservation and Recovery Act (RCRA), Hazardous and Solid Waste Amendments (HSWA), and the PPA of 1990. The U.S. Air Force Program requires each installation to develop a Pollution Prevention Management Plan (PPMP) outlining an overall program strategy. The PPMP along with the Hazardous Waste Management Plan, the Wastewater Management Plan, Hazardous Materials Emergency Response Plan, Solid Waste Management Plan, and other associated waste minimization directives and plans, forms the basis for reducing pollution at Vandenberg AFB. The PPMP is applicable to all entities including military units, DOD and non-DOD agencies, government and non-government contractors, and commercial operators conducting activities on Vandenberg AFB and its remote sites that generate air emissions, hazardous and solid wastes and wastewater.

Potential impacts on pollution prevention resulting from the proposed stabilization and retrofit repair of the 13th Street Bridge at Vandenberg AFB would affect primarily Santa Barbara County, California. The ROI considered in this EA for pollution prevention is Santa Barbara County.

The Air Force has established specific minimization/reduction goals for selected P2 Program components:

- Ozone depleting chemicals (ODCs);
- Environmental Protection Agency 17 (EPA-17) industrial toxic project chemicals;
- Hazardous waste;
- Municipal solid waste;
- Environmentally preferred products;
- Energy conservation;
- Water conservation;
- Emergency Planning and Community Right-to-Know Act (EPCRA)/Toxic Release Inventory chemical releases; and
- Pesticide management.

The P2 Program addresses waste generation, material acquisition, handling and use of materials, production and operational activities, process management, waste management, and waste disposal. It is a cradle-to-grave approach, wherein there is an accounting of what enters, what is used, and what leaves Vandenberg AFB.

3.12 Socioeconomics

The influence of Vandenberg AFB on population and employment within Santa

Barbara County varies widely. Vandenberg AFB generally influences northern Santa Barbara County, which encompasses the city of Lompoc, the unincorporated area north of Lompoc, and the Santa Maria Valley. Although Vandenberg AFB draws commuters from southern San Luis Obispo County, commuters from this region are estimated to comprise fewer than 5 percent of the total San Luis Obispo County work force.

The potential socioeconomic impacts resulting from the proposed stabilization and retrofit repair of the 13th Street Bridge at Vandenberg AFB would occur primarily within Santa Barbara County, California. The ROI considered in this EA for socioeconomics is the Lompoc Valley in northwestern Santa Barbara County, and specifically, the city of Lompoc.

As of January 2002, the Santa Barbara County population was estimated at approximately 407,900. Santa Maria, with 80,500 residents, and Lompoc, with 41,650 residents, are the principal communities within the northern portion of the county, and the second and third largest cities, respectively, in the county (California Department of Finance, Economic Research 2002).

In 2000, Santa Barbara County had 165,400 non-agricultural wage and salary employments. Of these, construction related industry accounted for 8,100 jobs or 4.9% of the 2000 total (California Department of Finance, Economic Research 2001).

3.13 Environmental Justice

The President issued Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations, on February 11, 1994. A Presidential Transmittal Memorandum accompanying this Order states that "Each Federal agency shall analyze the environmental effects, including human health, economic and social effects, of Federal actions including effects on minority communities and low-income communities, when such analysis is required by the NEPA 42 USC Section 4321, et seq." Under 32 CFR Part 989.33, Environmental Justice Analyses, as specified in the Executive Order, are to be included in Air Force Base NEPA documents.

The 2000 Census of Population and Housing reports numbers of both minority and property residents. Minority populations included in the census are identified as Black or African American, American Indian and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, Hispanic or Latino, and Other. Poverty status is reported as the number of families with income below the federal poverty level. The federal poverty level in 1999 for a family of four in the lower 48-states was $16,700.

The potential economic and environmental impacts resulting from the proposed stabilization and retrofit repair of the 13th Street Bridge at Vandenberg AFB would occur primarily within Santa Barbara County, California. The ROI considered in this EA for environmental justice is the Lompoc Valley in northwestern Santa Barbara County, and specifically, the city of Lompoc.

Based upon the 2000 Census of Population and Housing, Santa Barbara County had a population of 399,347 persons. Of this total, 108,929 persons, or 27.3 percent, were minority, and 55,086 persons, or 14.3 percent, were low-income. The city of Lompoc had a population of 41,103 persons. Of this total, 14,053 persons, or 34.2 percent, were minority, and 16,148 persons, or 39.3 percent, were low-income.

Chapter 4. Environmental Consequences

This chapter presents the results of the analysis of potential environmental effects of implementing the Proposed Action and the No-Action Alternative. For each environmental component, anticipated impacts are assessed considering short- and long-term effects.

4.1 Project Impacts to Biological Resources

Federal agencies are required by Section 7 of the Endangered Species Act of 1973, as amended (16 USC 1531 *et seq.*), to assess the effect of any project on federally listed threatened and endangered species. Under Section 7, consultation with the USFWS and NOAA Fisheries is required for federal projects if such actions could directly or indirectly affect listed species or destroy or adversely modify critical habitat. It is also Air Force policy to consider listed and special status species recognized by state agencies when evaluating impacts of a project. Impacts to biological resources would occur if special status species (endangered, threatened, rare, or candidate) or their habitats, as designated by federal and state agencies, would be affected directly or indirectly by project-related activities. These impacts can be short- or long-term impacts, for example, short-term or temporary impacts from noise and dust during construction, and long-term impacts from the loss of vegetation and thereby loss of the capacity of habitats to support wildlife populations.

On 20 March 2003, Vandenberg AFB initiated formal Section 7 consultation with the USFWS and NOAA Fisheries to address potential adverse impacts to federally protected wildlife species, associated with the retrofit of the 13th Street Bridge.

Impacts to jurisdictional waters of the United States and wetlands are considered significant if the project would result in net loss of wetland area or habitat value, either through direct or indirect impacts to wetland vegetation, loss of habitat for wildlife, degradation of water quality, or alterations in hydrological function.

Different species are subject to different impacts and different sites support different densities due to spatial variation in the number and type of habitats, the presence or absence of unique habitat features such as streams or vernal wetlands, and the degree of human-induced disturbance.

Adverse impacts from the emergency repair, temporary shoring project, and proposed retrofit to the 13th Street Bridge are expected to be temporary and short-term. Construction constraints and monitoring measures as described in Section 2.2.5, and the implementation of a habitat restoration plan after completion of construction activities (see Appendix D) will minimize these adverse impacts to native plant communities and special status plant and wildlife species. However, restored habitat will be subjected to new disturbances at the time of the full replacement of the bridge.

Potential project impacts specific to habitats and species are discussed in further detail in the sections that follow.

4.1.1 Emergency Repair

4.1.1.1 Native Habitats and Plant Species

Potential impacts to native plant communities and plant species include:

- short-term (temporary) and long-term (permanent) loss of habitat from construction related activities such as access, excavation, and placement of rock riprap;
- loss of individuals within the work area due to excavation, crushing or burial;
- loss of individuals in habitats adjacent to work areas due to soil erosion; and
- soil erosion in wetlands or open water adjacent to the project site.

Potential project related impacts to native plant communities, and special status plant species are listed in Table 4-1.

Table 4-1. Potential 13th Street Bridge project related impacts to native plant communities.

COMMUNITY	EMERGENCY REPAIR	PROPOSED RETROFIT	NET GAIN OR LOSS
Southern Willow Scrub	Short-term loss of 0.2 acre.	Permanent loss of 1.3 acres.	Net loss of 1.3 acre. *Unknown amount of long-term gain downstream*
Freshwater Marsh	Short-term loss of 0.2 acre. Permanent loss of 0.2 acre.	Short-term loss of 0.8 acre. Permanent loss of 0.1 acre. Long-term gain of 0.8 acre.	Net gain of 0.5 acre
Central Coast Scrub	Short-term loss of 1.2 acres.	Short-term loss of 1.2 acres.	

Placement of rock riprap along the northern bank of the river resulted in the removal of approximately 0.2 acre of willow scrub habitat. Construction requirements for placement of the rock riprap around the bridge piers during the emergency repair also resulted in the removal of approximately 0.4 acre of freshwater marsh vegetation. Approximately 0.2 acre of this freshwater marsh vegetation is not expected to re-establish due to the placement of rock riprap around the piers and at the base of the northerly abutment. However, approximately 0.2 acre is expected to reestablish after full completion of the project (fall of 2003).

The emergency repair did not result in long-term impacts on the location, size or course of the active river channels. In addition, no adverse impacts to the coastal zone, as defined by the Coastal Zone Management Act (CZMA) occurred as a result of construction activities associated with this emergency repair.

Approximately 1.2 acres of coastal scrub were removed during the emergency repair to create the construction staging areas and the temporary access roads at the northern approach of the 13th Street Bridge. Because the root systems were not removed, this vegetation is expected to resprout once all construction is completed at the end of the proposed retrofit.

One patch of giant reed, an exotic species known to aggressively invade riparian habitats, was present adjacent to bridge pier 8, and was removed during construction activities.

No special-status plant species were found within the project area during the botanical surveys. No historical records exist for the Black-flowered figwort, and La Graciosa thistle was last documented in the vicinity of the project area in 1958. Therefore, no adverse impacts to special-status plant species occurred during the emergency repair.

4.1.1.2 Wildlife Species

Freshwater marsh and riparian communities are highly productive wildlife habitats; removal of vegetation and a temporary loss of these communities during project implementation

could be considered a potentially adverse impact on wildlife habitat. Construction activities also generate noise that could result in a potentially adverse short-term (temporary) impact on wildlife resources. Noise generated by construction activities was observed to have resulted in temporary isolated instances of disturbance to some avian species, and some mammalian species (rodents). The level of impact associated with construction noise is discussed in more detail below.

The potential impacts to wildlife species associated with the construction activities of this project included:

- short-term (temporary) and long-term (permanent) loss of habitat from construction related activities such as access, excavation, and placement of rock riprap;
- loss of individuals within the work area due to excavation, crushing or burial;
- loss of individuals in habitats adjacent to work areas due to soil erosion;
- abandonment of breeding and/or roosting sites due to project related noise and associated disturbance;
- disruption of foraging or roosting activities due to project related noise and associated disturbance; and
- soil erosion into wetlands or open water adjacent to the project site.
- degradation of water quality due to turbidity.

Observations by the monitors during the course of the construction period indicated that turbidity was minimal outside of the construction zone. The use of silt fencing, the temporary containment of the active river channel outside the construction zone, and the placement of block nets downstream of the construction zone, greatly reduced turbidity and sediment build-up. No loss of individuals occurred within the work area due to excavation, crushing or burial, or in habitats adjacent to the work area due to soil erosion. Soil erosion into wetlands or open water adjacent to the project site was also not observed by the monitors.

Construction constraints and monitoring measures were effective in minimizing adverse impacts to wildlife species.

Construction Noise

Wildlife, including mammals, amphibians, reptiles, fish, and birds, present in the area could have been affected by construction noise. One of the most useful measurements to assess the effects of noise is the one-hour average sound level, abbreviated L_{eq1H}. The L_{eq1H} can be thought of in terms of *equivalent* sound. For example a L_{eq1H} of 45.3 decibels (dB) is what would be measured if a sound measurement device were placed in a sound field of 45.3 dB for one hour. However, this is not what happens during real sound measurements. When a L_{eq1H} level of 45.3 dB is measured, the sound level has fluctuated above and below 45.3dB, but the *average* during that hour is 45.3 dB. The L_{eq1H} is usually A-weighted unless specified otherwise. A-weighting is a standard filter used in acoustics that approximates human hearing and in many cases is the most appropriate weighting filter when investigating sound effects on wildlife as well as humans. L_{eq} measurements can also be specified for other time periods such as eight or 24-hour periods. Predictions of non-transient noise levels for construction activities associated with the emergency repair, temporary shoring, and the proposed retrofit were developed for distances up to 1000 feet (Table 4-2) with the assumption that equipment was located in one area and operating simultaneously.

During the emergency repair, several types of activities were found to create transient noises, mainly associated with collisions between construction equipment and rocks.

Table 4-2. L_{eq1h} noise levels as a result of continuous construction activities.

Distance from Construction Area (feet)	Emergency Repair L_{EQ} (dB)	Temporary Shoring Project L_{EQ} (dB)	Proposed Retrofit L_{EQ} (dB)
50	94.5	89.7	99.9
100	90.0	85.2	95.4
300	82.8	80.7	88.2
500	79.5	74.7	84.9
1000	75.0	70.2	80.4

Measurements of the noise associated with these activities were performed with a Larson Davis 820 sound level meter to measure Lmax values. Lmax is the greatest sound level reached during a sound event (Table 4-3).

Table 4-3. Lmax noise levels of transient construction activities

Distance from Construction Area (feet)	Lmax Average (dB)	Lmax Range (dB)
50	96.3	99.3 – 91.2
100	91.8	94.8 – 86.6
300	84.7	87.6 – 79.5
500	81.3	84.3 – 76.2
1000	76.8	79.8 – 71.6

On Vandenberg AFB, L_{eq1H} measurements have been found to range from 35 to 60 dB, with the higher level representative of areas with higher traffic (SRS 2001). To place noise levels in perspective, a food blender at a distance of three feet generates 90 dBA (A-weighted decibels). Riding an automobile at 40 miles per hour produces approximately 75 dBA. Normal speech is approximately 60 dBA. Measurements of noise levels in riparian habitat approximately 300 feet west of the 13th Street Bridge indicate ambient L_{eq1H} ranging between 33.8 and 47.9 dB, with an average of 39.7 dB (Francine 1999). Consequently, short-term disturbance of noise-sensitive wildlife species near the construction site could have occurred.

Wildlife response to noise can be physiological or behavioral. Physiological responses can range from mild, such as an increase in heart rate, to more damaging effects on metabolism and hormone balance. Behavioral responses to man-made noise include attraction, tolerance, and aversion. Each has the potential for negative and positive effects, which vary among species and among individuals of a particular species due to temperament, sex, age, and prior experience with noise. Responses to noise are species-specific; therefore, it is not possible to make exact predictions about hearing thresholds of a particular species based on data from another species, even those with similar hearing patterns.

Fish.

Various fish species react differently to sound. The noise generated by construction would represent a change in ambient conditions in the river, and fish species in the Santa Ynez River are expected to respond to the noise and vibration. Fish would be expected to move away from vibration and noise. Therefore, this project may have caused short-term disturbance to fish species in the project area.

Herpetofauna.

Reptile and amphibian hearing is poorly studied. However, reptiles and amphibians are sensitive to vibrations, which provide information about approaching predators and prey. Vibration and noise associated with construction activities would potentially cause short-term disturbance to amphibians (e.g., California red-legged frog). In addition, removal of vegetation and wood debris caused the loss of habitat for some species (i.e., treefrogs and snakes), which were observed moving away from the area.

Birds.

Observed impacts to birds resulting from construction and human generated noise, and

habitat removal, include disruption in foraging, roosting, and courtship activities. Monitors observed birds moving away from the area of disturbance during construction activities. However, once activities ceased, birds were also observed returning to the area.

The Migratory Bird Treaty Act provides federal protection to all native avian species, their nests, eggs, and unfledged young. The emergency repair did not occur during the breeding season, thus no adverse effects on breeding avian species occurred. In addition, construction activities associated with the emergency repair resulted only in short-term noise disturbances that may have temporarily disrupted foraging and roosting activities of individual birds. These disturbances were not considered of a magnitude to result in adverse impacts to bird populations within the vicinity of the project area.

Mammals.

Impacts to mammalian species observed during construction activities for the emergency repair included disruption of normal activities due to noise and ground disturbances. Two dusky-footed woodrats were observed abandoning an area in the coastal scrub near the northerly abutment where a woodrat den was destroyed during vegetation removal. Likewise, several small rodents (most likely *Peromyscus* spp.) were observed abandoning the area underneath the northerly abutment when wood debris was cleared. No disturbances to bat species roosting underneath the bridge were observed, and fresh guano was observed underneath the bridge deck on the piers during the construction period, providing evidence that bats did not abandon their roosts.

4.1.1.3 Special Status Wildlife Species

The emergency repair was completed between December 20, 2002 and January 17, 2003. Biological monitoring activities are summarized in Appendix E. Biological monitors were present throughout the construction period to document the presence of and minimize impacts to special status species present within the project area. Because the emergency repair occurred outside of the nesting season for bird species, monitoring activities concentrated on amphibian, reptile and fish species. Construction constraints and monitoring during the emergency repair incorporated recommendation received from USFWS and NOAA Fisheries, during informal consultations with these agencies prior to the start of work on the emergency repair. Construction constraints and monitoring measures implemented during the emergency repair are described in section 2.2.5 and Appendix E of this EA.

Potential project related impacts to special status wildlife species are listed in Table 4-4.

Herpetofauna.

Vegetation was removed from the northerly riverbank to install the riprap at the abutment and northern bank, and from the riverbed to install riprap around the northerly piers (piers 7, 8 and 9). This removal of vegetative cover could degrade habitat quality for California red-legged frogs. However, the area affected was small and not known to support breeding by California red-legged frogs. The implementation of a Habitat Restoration Plan will help to restore vegetative cover adversely impacted within the project area.

Construction activities had the potential to result in incidental take of some individuals of California red-legged frog and Southern Pacific pond turtle, from disturbance and possible mortality during project activities, and during capture and relocation efforts prior to and during construction of the project. Construction constraints and monitoring measures implemented during the emergency repair to minimize adverse impacts to these species are presented in Section 2.2.5. No injury or

Table 4-4. Potential 13th Street Bridge project related impacts to special-status wildlife species.

COMMON NAME *SCIENTIFIC NAME*	STATUS[1]	POTENTIAL IMPACTS
California red-legged frog *Rana aurora draytonii*	FT/CSC	Temporary loss of habitat; disturbance due to noise; entrapment in project area; temporary decrease of habitat quality due to turbidity.
Southern Pacific pond turtle *Clemmys marmorata pallida*	FSC/CSC	Temporary loss of habitat; disturbance due to noise; entrapment in project area; temporary decrease of habitat quality due to turbidity.
Southern steelhead *Oncorhynchus mykiss*	FE/CSC	Temporary decrease of habitat quality due to turbidity; entrapment in project area.
Tidewater goby *Eucyclogobius newberryi*	FE/CSC	Temporary decrease of habitat quality due to turbidity; entrapment in project area.
Arroyo chub *Gila orcutti*	CSC	Temporary decrease of habitat quality due to turbidity; entrapment in project area.
American bittern *Botarus lentiginosus*	FSC	Temporary loss of habitat; temporary disturbance due to noise.
Ferruginous hawk *Buteo regalis*	FSC/CSC (wintering)	Temporary disturbance due to noise.
Northern harrier *Circus cyaneus*	CSC (nesting)	Temporary disturbance due to noise; abandonment of breeding site.
Merlin *Falco columbarius*	CSC (wintering)	Temporary disturbance due to noise.
Allen's hummingbird *Sealsphorus sasin*	FSC (nesting)	Temporary loss of habitat; temporary disturbance due to noise.
Pacfic-slope flycatcher *Empidonax difficilis*	FSC (nesting)	Temporary loss of habitat; abandonment of breeding site; temporary disturbance due to noise.
Southwestern willow flycatcher *Empidonax traillii extimus*	FE/SE	Temporary loss of habitat; abandonment of breeding site; temporary disturbance due to noise.
Loggerhead shrike *Lanius ludovicianus*	FSC/CSC	Abandonment of breeding site; temporary disturbance due to noise.
Horned lark *Eremophila alpestris*	CSC	Abandonment of breeding site; temporary disturbance due to noise.
Yellow warbler *Dendroica petechia*	CSC (nesting)	Temporary loss of habitat; abandonment of breeding site; temporary disturbance due to noise.
California thrasher *Toxostoma redivivum*	FSC	Temporary loss of habitat; abandonment of breeding site; temporary disturbance due to noise.
Tricolored blackbird *(Agelaius tricolor)*	FSC/CSC	Temporary disturbance due to noise.
Lawrence's goldfinch *(Carduelis lawrencei)*	FSC (nesting)	Temporary loss of habitat; abandonment of breeding site; temporary disturbance due to noise.
Pallid bat *Antrozous pallidus*	CSC	Temporary loss of roosting site; temporary disturbance due to noise.
Yuma myotis *Myotis yumanensis*	FSC	Temporary loss of roosting site; abandonment of breeding site; temporary disturbance due to noise.

1 FE=Federal Endangered Species; FT=Federal Threatened Species; FSC=Federal Species of Concern
SE=State Endangered Species; CSC=California Species of Concern

mortality to California red-legged frogs or Southern Pacific pond turtles was observed during the emergency repair project.

Fish.

Project construction had the potential to result in incidental take of some individuals of Southern steelhead, tidewater gobies and arroyo chub, from disturbance and possible mortality during project activities, and during capture and relocation efforts prior to and during construction of the project. Construction constraints and monitoring measures implemented during the emergency repair to minimize adverse impacts to these species are described in Section 2.2.5. No injury or

mortality to special-status fishes was observed during the emergency repair project.

Changes in water flow, draining of areas with ponded water, resulting increases in turbidity, and removal of riparian vegetation associated with implementing the emergency repair had the potential to adversely impact habitat for the southern steelhead and tidewater goby in the short-term. Specifically, the water quality and quantity, substrate, and vegetative overstory could have been affected in and possibly downstream of the project area. However, the affected area is small and used by steelhead and tidewater gobies as a migration and dispersal corridor only, with no breeding documented in the project area. Construction constraints and monitoring measures implemented during the emergency repair (and planned for the proposed retrofit) to minimize adverse impacts to the aquatic habitat are described in Section 2.2.5.

Birds.

The emergency repair was completed outside the normal breeding season for avian species. Thus, potential adverse impacts to special status breeding birds were avoided. No direct mortality to adult willow flycatchers or other special-status bird species, their nests or young occurred.

The emergency repair project did not directly impact previously occupied Southwestern willow flycatcher habitat downstream of the 13th Street Bridge, and minimization measures avoided downstream effects that could have indirectly impacted nesting habitat. Removal of the small amount of riparian vegetation within the project footprint did not significantly affect available habitat for willow flycatchers or other special-status bird species along the Santa Ynez River. Construction constraints and monitoring measures to reduce adverse impacts to willow flycatchers and other special-status bird species are included in Section 2.2.5.

Mammals.

Pallid bats and Yuma myotis are known to use the 13th Street Bridge as a roosting site. A study recently completed on the bats of Vandenberg AFB, indicates that Yuma myotis use abandoned swallow nests underneath this bridge as maternity roosts to rear their young. Construction related disturbances could result in short-term abandonment of this roosting site by adult bats. If adult females with young abandon this site, the young left behind would perish. However, the emergency repair was completed outside the breeding season for bats. Thus, no adverse impacts to nursing bats and their young occurred. No impacts to roosting bats were observed during the construction period.

Monitoring Results (See Appendix E)

The following special status species were captured and relocated outside the construction zone during the emergency repair:

- Tidewater goby: 1,579

  All tidewater gobies were relocated downstream of the construction zone.

- California red-legged frog: 14

  Twelve California red-legged frogs were relocated downstream of the construction zone and two were relocated to Bear Creek Pond.

The following exotic species were removed during the emergency repair:

- Bullfrog (*Rana catesbeiana*): 10

Monitoring activities during the emergency repair indicated that the construction constraints and monitoring measures implemented were adequate and effective in protecting special status species present within the construction area. These measures are described in detail in Section 2.2.5.

4.1.2 Temporary Shoring Project

4.1.2.1 Native Habitats and Plant Species

The temporary shoring project resulted in the disturbance of approximately 2.74 acres. However, approximately 1.8 acres were previously disturbed during the emergency repair in December 2002-January 2003 (Table 4-1). Most of the disturbance resulting from the construction work associated with this action was within the riverbed for creating the berms at the inlet and outlet of the 48-inch HDPE river flow maintenance pipes, and the sand bar between piers 2 and 5. A minimal amount of willow scrub was disturbed by the construction activities in the process of installing the temporary access roads across the riverbed and adjacent to the bridge piers. In addition, some freshwater marsh was disturbed as a result of the activities associated with the installation of the HDPE pipes and berms to maintain river flow. However, both of these disturbances to habitat are also anticipated to occur during the Proposed Retrofit (section 4.1.3). Thus, no additional habitat loss occurred from the construction activities associated with the temporary shoring project.

No special-status plant species were found within the project area during the botanical surveys. No historical records exist for the Black-flowered figwort, and La Graciosa thistle was last documented in the vicinity of the project area in 1958. Based on their rarity, the likelihood of these species occurring is very low. No listed or proposed listed plant species were found in the project area during construction work. Therefore, no adverse impacts to special-status plant species occurred.

On 28 March 2003, Vandenberg AFB submitted a request for a Section 404 permit from the ACOE for the temporary shoring project. This permit was received on April 10, 2003. Vandenberg AFB and the contractor adhered to all terms and conditions set forth in this permit.

4.1.2.2 Wildlife Species

Construction work associated with the installation of the temporary shoring started on April 14, 2003. Construction activities continued for 11 days, until April 25, 2003. This work was a shorter construction project than the emergency repair (11 days versus 28 days respectively). However, the work occurred during the early part of the breeding season for many wildlife species, including birds and bats that occur on the bridge structure itself. These construction activities had the potential of causing abandonment of nests and unfledged young by adult cliff swallows (*Petrochelidon pyrrhonota*) that nest underneath the 13th Street Bridge. Cliff swallows are not a special status species; however, the Migratory Bird Treaty Act provides federal protection to this species, its nests, eggs, and unfledged young. To minimize potential disturbances to nesting swallows, repellent devices were installed in the bridge before nesting occurred (first week of April), to discourage swallows from establishing new nests. Some swallows persisted in nest building activities on the bridge and were monitored during the construction period for disturbance (Appendix E).

In other respects, potential impacts to wildlife species from construction activities and construction-generated noise, were similar to those described for the emergency action (Section 4.1.1.2). Implementation of the construction constraints and monitoring measures described in Section 2.2.5 were effective in minimizing disturbances to wildlife species and breeding avian and bat species.

4.1.2.3 Special Status Wildlife Species

Potential impacts to special status wildlife species are anticipated to be similar to those described under the emergency repair (Section

4.1.1.3). However, because the temporary shoring was installed during the breeding season for avian and bat species, additional potential adverse impacts had the potential to occur to special status bird and bat species as described below.

Birds.

Disturbances associated with construction activities for the installation of the temporary shoring could cause short-term disturbance to the Southwestern willow flycatcher, and other breeding special-status species.

The possible impacts of disturbance on southwestern willow flycatchers are abandonment of breeding sites, egg breakage by "panicked" adults, physical damage to the eggs due to noise, heating and cooling from exposure during periods of nest abandonment, and increased vulnerability to predation. Increased levels of human activity and associated noise generated during the proposed retrofit could potentially displace southwestern willow flycatchers from nesting habitat. The severity of the impact would depend in a large part on the timing of the activity relative to the stage of the breeding cycle. If disturbance occurs after nesting has already been initiated, construction-related noise could adversely impact reproductive success. However, if disturbance is initiated before nesting begins, the birds may move to other suitable habitat further away from the project site. Construction activities associated with the temporary shoring occurred before the arrival and initiation of nesting by willow flycatchers.

The project did not directly impact previously occupied Southwestern willow flycatcher habitat downstream of the 13th Street Bridge, and construction constraints and monitoring measures avoided downstream effects that could indirectly impact nesting habitat. Removal of the small amount of riparian vegetation within the project footprint did not significantly affect available habitat for willow flycatchers or other special-status bird species along the Santa Ynez River. No direct mortality to adult willow flycatchers or other special-status bird species, their nests or young occurred. However, if willow flycatchers or other special-status bird species nest within or near the project area in spring of 2003, abandonment of eggs and/or young due to construction-related disturbance is possible. Construction constraints and monitoring measures described in section 2.2.5 were effective in minimizing disturbance and adverse impacts to willow flycatchers and other special-status bird species that may have been present in the vicinity of the work area.

Mammals.

Pallid bats and Yuma myotis are known to use the 13th Street Bridge as a roosting site. A study recently completed on the bats of Vandenberg AFB, indicates that Yuma myotis use abandoned swallow nests underneath this bridge as maternity roosts to rear their young. Construction related disturbances could result in short-term abandonment of this roosting site by adult bats. If adult females with young abandon this site, the young left behind would perish. Deterrent equipment was installed on the bridge the first week of April 2003 to encourage bats to find alternate roost locations, and minimize this impact. Work began before bats gave birth to their young, allowing the bats to either habituate to the disturbance or seek alternate roost sites. No adverse impacts to breeding bats were documented during the short construction period (11 days).

4.1.3 Proposed Retrofit

4.1.3.1 Native Habitats and Plant Species

Placement of rock riprap and the pile retard system on the northerly bank during the proposed retrofit would result in the permanent loss of approximately 1.3 acres of willow scrub.

Placement of additional rock riprap and the pile retard system at this time, would also result in the removal of approximately 0.9 acre of freshwater marsh vegetation. Approximately 0.1 acre of this freshwater marsh will be permanently lost, with the remaining 0.8 acre expected to reestablish after completion of the project. These impacts are in addition to habitat impacts from the emergency repair project (Table 4-1).

Over the long term, the pile retard system should enhance habitat by reducing bank scour and facilitating establishment of wetland and riparian vegetation in the backwater areas created by it. Although a loss of 1.3 acres of willow scrub is anticipated to result from the installation of this pile retard system, it is expected that freshwater marsh (estimated at 0.8 acre) will become established around the piles of this system, resulting in a net gain of 0.5 acre of freshwater marsh. Although difficult to estimate, an increase in willow scrub is expected to occur downstream of the pile retard system. Willow scrub is expected to reestablish itself on the northern bank as the erosion and scouring are diminished on the bank by the protection afforded with the pile retard system. In addition, with the expected shift of the river flow towards the center of the river channel, as a result of the pile retard system and the riprap protection on the northern abutment, willow scrub is also expected to emerge over time on the riverbed at the base of the bank (the same as it occurred when the river flow shifted from the center of the riverbed to the northern portion).

Table 4-1 in Section 4.1.1.1 summarizes the potential short-term (temporary) and long-term (permanent) losses and gains in native habitats as a result of the proposed retrofit. It is anticipated that upon completion of the project there will be a net loss of 1.3 acres of willow scrub and a net gain of 0.5 acre of freshwater marsh in addition to the re-establishment of new willow scrub habitat downstream of the pile retard system.

The proposed retrofit is not expected to have any long-term significant adverse impacts on aquatic habitat or the location, size or course of the river channel. In addition, no adverse impacts to the coastal zone, as defined by the Coastal Zone Management Act (CZMA) are anticipated as a result of construction activities associated with the proposed retrofit.

Vandenberg AFB requested a Section 404 permit from the ACOE for the emergency repair and the proposed retrofit of the 13th Street Bridge in December 2002. Vandenberg AFB and the contractor will adhere to all terms and conditions set forth in this permit.

No special-status plant species were found within the project area during the botanical surveys. No historical records exist for the Black-flowered figwort, and La Graciosa thistle was last documented in the vicinity of the project area in 1958. Based on their rarity, the likelihood of these species occurring is very low. Therefore, since no listed or proposed listed plant species were found or are likely to occur in the project area, no adverse impacts to special-status plant species are expected to occur with implementation of the proposed retrofit.

4.1.3.2 Wildlife Species

The proposed retrofit would be implemented starting in the summer of 2003. The proposed retrofit would be a longer construction project than the emergency repair and the temporary shoring project (150 days versus 28 days and 42 days, respectively), and would occur during the breeding season for many wildlife species, including birds and bats that occur on the bridge structure itself.

In other respects, potential impacts to wildlife species from construction activities and construction generated noise, are expected to be similar to those described for the emergency action (Section 4.1.1.2) and the temporary

shoring (Section 4.1.2.2). Construction constraints and monitoring measures recommended for implementation during the proposed retrofit include those implemented for the emergency repair and temporary shoring project, in addition to measures to minimize potential impacts to breeding avian and bat species (Section 2.2.5).

4.1.3.3 Special Status Wildlife Species

Potential impacts to special status wildlife species are anticipated to be similar to those described under the emergency repair (Section 4.1.1.3) and the temporary shoring (Section 4.1.2.3). Because the proposed retrofit would impact the same area as the temporary shoring, no additional new impacts are expected to occur to special status wildlife species other than prolonged disturbances due to the longer construction period.

Construction constraints and monitoring measures to reduce adverse impacts to willow flycatchers and other special-status bird and mammal species are presented Section 2.2.5.

4.1.4 No-Action Alternative

Under the No-Action Alternative, the 13th Street Bridge would not undergo any repairs or retrofit and the banks near the bridge would remain in their present state and not be protected. While construction related disturbances to native plant communities and special status plant and wildlife species would be avoided, erosion and scouring of the banks and the bridge structure would continue to occur as a result of high river flows, especially during storm events. Wetlands and riparian habitats along the northerly bank of the Santa Ynez River would continue to be degraded by the erosion and scouring, reducing available habitat to listed species within the area. In addition, the risk of a bridge collapse could result in more serious adverse impacts to habitats of listed species and to the listed species themselves as a result of the bridge failure itself and the subsequent construction work that would be required to remove debris from the riverbed.

4.2 Project Impacts to Water Resources

4.2.1 Proposed Action

The Proposed Action would require CWA Section 401 Water Quality Certification from the CCRWQCB, a Section 404 Permit from the ACOE, and a National Pollutant Discharge Elimination System (NDPES) General Permit to ensure water discharged meets water quality standards at the point of discharge. A Storm Water Pollution Prevention Plan (SWPPP) will be developed and implemented to maintain compliance with the NPDES permit.

Vandenberg AFB has received the CWA Section 401 Water Quality Certification. Vandenberg AFB also received Section 404 Permits from the ACOE for the emergency repair and proposed retrofit and for the temporary shoring project. The NDPES permit has been granted and a SWPPP plan has been developed and approved by Vandenberg AFB, 30th CES/CEV.

4.2.1.1 Floodplain

The 13th Street Bridge is located within the Santa Ynez River floodplain. This bridge is the only on-base transport route and vehicle link between North and South Vandenberg AFB and supports communication lines that area essential for mission accomplishment. As such, the 13th Street Bridge must be maintained to ensure its integrity and safety. Any repairs, or improvements to the bridge to ensure its integrity and safety, would necessitate working within the Santa Ynez River floodplain. A replacement of the bridge would also necessitate working within this floodplain, even if another site were selected for its placement. Chapter 2

of this EA supports the finding that there is no practicable alternative to construction within the floodplain or wetland areas.

Construction activities associated with the emergency repair occurred during high flow months and the proposed retrofit would occur during low flow months. The floodplain limits in the vicinity of the 13th Street Bridge were not altered by the constructions activities associated with the emergency repair. The proposed retrofit is not expected to alter the floodplains.

4.2.1.2 Hydraulics

During the emergency repair, the active river channels were temporarily contained by placing a K-rail barrier that allowed for the uninterrupted flow to pass between piers 6 and 7 (outside the active construction zone) and minimized adverse impacts to water resources.

During the proposed retrofit, the active river channels will be temporarily contained in culverts, providing passage underneath the surface of the construction zone. This would allow the river to maintain its seasonal hydraulic capacity and minimize adverse impacts to water resources.

4.2.1.3 Groundwater

The temporary containment of the river minimized adverse impacts to groundwater encountered during excavation activities associated with the emergency repair.

During the proposed retrofit, the temporary containment of the river and the use of cofferdams would also minimize adverse impacts to groundwater encountered during excavation activities associated with construction activities. Water pumped out of the excavations during the proposed retrofit would be filtered and discharged into a vegetated area within the riverbed and downstream of the project area at a location approved by 30th CES/CEVC (Water Quality), and shall be addressed in the project's SWPPP. The rocks would displace groundwater encountered during the rock slope protection activities at the northern abutment. This water would be allowed to naturally percolate.

4.2.1.4 Sediment

Increases in sedimentation load in the vicinity of the 13th Street Bridge was minimized during the emergency repair of the project by maintaining the active channels outside the construction zone with a temporary K-rail barrier, and by implementing BMP's (i.e., silt fencing).

During the proposed retrofit, increases in sediment load near the 13th Street Bridge construction area would be minimized by the use of pipes to contain the active channels, and by implementation of BMP's (i.e., silt fencing). Likewise, the use of pipes for containment of the channels will prevent potential sedimentation loading to the river from the construction staging areas.

Implementation of the SWPPP will also reduce the potential of increased sedimentation loads. The habitat restoration plan (see Appendix D) that will be implemented post-construction will minimize potential sediment loading by allowing vegetation to grow and soil stabilization methods to be implemented before the beginning of the rainy season.

4.2.1.5 Water Quality

Construction activities would include the use of hazardous materials that could result in an adverse impact if not properly controlled and managed. The containment of the active channels in pipes, will minimize the exposure of the stream water to any construction related contaminants. Measures would be implemented for the duration of construction activities to prevent the accidental introduction of any hazardous materials into the Santa Ynez River

waterway and riverbed. These measures include:

- The repair and maintenance of all equipment, to the maximum extent possible, a minimum of 500 feet outside of the riverbed and riparian corridor.
- Refueling of all equipment, to the maximum extent possible, a minimum of 500 feet outside of the riverbed and riparian corridor.
- The storage of hazardous materials in proper containers to include secondary containment, within the staging areas outside the riverbed.

Because large cranes may require refueling within the riverbed, a riverbed refueling spill prevention and containment plan to include appropriate safety precautions and personnel training, will be developed by the contractor and provided to 30th CES/CEV for approval prior to initiation of the project. At a minimum the plan will include measures that will prevent the contamination of the substrate in the event of an accidental spill and an emergency clean-up plan in the event of an accidental spill.

4.2.2 No-Action Alternative

Under the No-Action Alternative, there would be no improvements to the bridge. Therefore, no water resources impacts would occur.

4.3 Project Impacts to Air Quality

The criteria for determining the significance of air quality impacts are based upon federal, state, and Santa Barbara County standards and regulations. Impacts to air quality would result if project emissions increase ambient pollutant concentrations from below the NAAQS or CAAQS to above these standards, or if they contribute measurably to an existing or projected ambient air quality standard violation.

4.3.1 Proposed Action

Construction activities, under the Proposed Action, occurred or will occur over approximately six months. Fugitive dust emissions generated as equipment operates on exposed ground and combustive emissions from the construction would cause air quality impacts. The largest air quality impacts would occur during the proposed retrofit and smaller impacts would occur during the proposed retrofit from the rock emplacement activities.

The U.S. Air Force is required to make a formal conformity analysis to determine whether the Proposed Action complies with the conformity rule found in the Clean Air Act. An Air Quality Analysis (Appendix F) was completed for the Proposed Action. The results of this analysis deemed the Proposed Action *de minimis* and not regionally significant and is exempt from further conformity requirements. This determination is in accordance with conformity requirements set for the in 40 CFR 93.153 (b), (c), and section 176 (c) (4) of the Clean Air Act.

Emergency Repair

During the emergency repair, dirt was excavated from the bridge piers and replaced with rock. In addition, rock was placed on the north bank of the river to prevent further erosion. Construction equipment for this emergency repair are presented in Appendix F, Table F-1, while the emission factors used to estimate the emissions are found in Table F-4. Fugitive dust in the form of PM_{10} would have been emitted at a rate of 1.41 tons from this emergency repair as equipment operated on exposed ground. Approximately 3.22 acres were estimated to have been disturbed by equipment during the emergency repair. For purposes of this analysis, it was estimated that an average of 1.07 acres per day were disturbed. It was further estimated that on a reasonable worst-case day, 1.61 acres were disturbed. With a disturbance of eight-hours per day, the reasonable worst-case day

fugitive dust emissions during the emergency repair would have been 141 pounds of PM_{10} per day. These emissions would not be expected to exceed any ambient air quality standard and therefore no adverse impacts from PM_{10} occurred.

The methodology and assumptions used to calculate emissions from the Proposed Action are presented in Appendix F. The daily and total emission from construction activities can be found in this Appendix in Tables F-5 and F-6, respectively. The daily emissions were estimated to be 68 pounds of CO, 194 pounds of NO_x, 153 pounds of PM_{10}, 18 pounds of ROC, and four pounds of SO_x. The project emissions from the emergency repair were estimated to be 0.56 tons of CO, 1.13 tons of NO_x, 1.47 tons of PM_{10}, and 0.12 tons of ROC, and 0.02 tons SO_x. Emissions from the emergency repair did not exceed the Santa Barbara County Air Pollution Control District (APCD) significance threshold of 25 tons per year. Therefore, no adverse impacts to the region's air quality occurred from the emergency repair.

Temporary Shoring

Estimates of construction equipment are presented in Appendix F, Table F-3, while the emission factors used to estimate the emissions are found in Table F-4. Fugitive dust in the form of PM_{10} would be emitted at a rate of 3.97 tons from the temporary shoring as equipment operates on exposed ground. During the shoring activities, it is estimated that 6.50 acres would be disturbed by equipment. For purposes of this analysis, it is estimated that an average of 2.17 acres per day would be disturbed. It was further estimated that on a reasonable worst-case day, 3.25 acres would be disturbed. With a disturbance of eight-hours per day, the reasonable worst-case day fugitive dust emissions during the proposed temporary shoring would be 284 pounds of PM_{10} per day. These emissions would not be expected to exceed any ambient air quality standard and therefore no adverse impacts from PM_{10} would occur.

The methodology and assumptions used to calculate emissions from the Proposed Action are presented in Appendix F. The daily and total emission from construction activities can be found in this Appendix in Tables F-9 and F-10, respectively. The daily emissions from the proposed temporary shoring were estimated to be 476 pounds of CO, 374 pounds of NO_x, 307 pounds of PM_{10}, 69 pounds of ROC, and seven pounds of SO_x. The project emissions from the temporary shoring activities were estimated to be 6.86 tons of CO, 2.11 tons of NO_x, 4.09 tons of PM_{10}, and 0.80 tons of ROC, and 0.03 tons SO_x.

Proposed Retrofit

Estimates of construction equipment are presented in Appendix F, Table F-3 while the emission factors used to estimate the emissions are found in Table F-4. Fugitive dust in the form of PM_{10} would be emitted at a rate of 14.18 tons from the proposed retrofit as equipment operates on exposed ground. During the proposed retrofit, it is estimated that 6.50 acres would be disturbed by equipment. For purposes of this analysis, it is estimated that an average of 2.17 acres per day would be disturbed. It was further estimated that on a reasonable worst-case day, 3.25 acres would be disturbed. With a disturbance of eight-hours per day, the reasonable worst-case day fugitive dust emissions during the proposed retrofit would be 284 pounds of PM_{10} per day. These emissions would not be expected to exceed any ambient air quality standard and therefore no adverse impacts from PM_{10} would occur.

The methodology and assumptions used to calculate emissions from Proposed Action are presented in Appendix F. The daily and total emission from construction activities can be found in this Appendix in Tables F-9 and F-10, respectively. The daily emissions from the

proposed retrofit were estimated to be 693 pounds of CO, 301 pounds of NO_x, 304 pounds of PM_{10}, 73 pounds of ROC, and five pounds of SO_x. The project emissions from the proposed retrofit were estimated to be 35.24 tons of CO, 14.13 tons of NO_x, 15.13 tons of PM_{10}, and 3.83 tons of ROC, and 0.25 tons SO_x. The estimated cumulative project emissions, which are presented in Appendix F, Table F-10, are estimated to be 42.66 tons of CO, 17.37 tons of NO_x, 20.69 tons of PM_{10}, and 4.74 tons of ROC, and 0.29 tons SO_x.

Except for CO emissions, the cumulative emissions from the proposed action would not be expected to exceed the APCD significance threshold of 25 tons per year and therefore no adverse impacts to the region's air quality are expected from the proposed retrofit. Deliver trucks and vehicles that are detoured around the bridge would produce a majority of CO emissions. As such, the CO emissions would be generated over a larger area and would not be expected to produce or contribute to an exceedance of the carbon monoxide NAAQS or CAAQS. Therefore, no adverse impacts from CO emissions are anticipated.

4.3.2 No-Action Alternative

Under the No-Action Alternative, there would be no improvements to the bridge. Therefore, no air quality impacts would occur.

4.4 Project Impacts to Cultural Resources

The criteria used to evaluate the significance of cultural resources and to assess potential adverse project effects are set forth in the National Historic Preservation Act (NHPA) of 1966. Associated regulations include 36 CFR 60 and 36 CFR 800. Under those regulations, a project would have an impact if it adversely affects a cultural resource that is eligible for the National Register of Historic Places (NRHP); if there is substantial disturbance or loss of data from newly discovered properties or features prior to their recordation, evaluation and possible treatment; or if the project substantially changes the natural environment or access to it such that the practice of traditional cultural or religious activities would be restricted. For known cultural resource sites, rerouting or redesigning to avoid impacts is typically the recommended option. If rerouting or redesigning is not possible, subsurface testing is usually recommended to determine a site's value or data potentials relative to the NRHP, to assess possible adverse project effects, and to establish the physical relationship of site boundaries with the APE. In addition, CEVPC requires archaeological and Native American monitoring during construction through or adjacent to any known site, regardless of a site's NRHP eligibility. Archaeological and Native American monitoring is also typically required in areas where buried sites are possible (Lebow and Moratto 2001).

4.4.1 Proposed Action

Archival research indicates that no archaeological sites were previously recorded within the APE. One unrecorded archaeological site is within 0.25 mile of the APE. Temporarily designated 'Pole 163', it is located on the south side of the river approximately 165 meters (541 feet) south of the APE, between Renwick Avenue and 13th Street. While the site boundary has not been established, the proposed action does not indicate ground-disturbing activities along the southern riverbank and therefore no adverse impact to the site is anticipated.

The proposed project area was surveyed in support of this project, and no archaeological sites were identified. Thus, no archaeological studies in accordance with Section 106 of the NHPA are required. The State Historic Preservation Officer will be notified, in accordance with 36 CFR 800.4(d), of the

methods used by Vandenberg AFB to determine that no cultural properties exist within or near the APE, prior to initiation to the proposed retrofit.

During the survey, it was noted that pedestrian access and visibility along the northern riverbank were extremely limited, particularly upstream of the bridge. It was not possible to examine about 75 percent of the northern riverbank to check for buried archaeological sites. Deeply buried sites such as 'Pole 163' are known to occur in alluvial areas such as the Santa Ynez River floodplain, and these sites are only observable in cut banks or construction excavations. It is the policy of Vandenberg AFB that construction through areas likely to contain buried sites will be monitored. For these reasons, monitoring of all ground-disturbing activities along the banks of the river is recommended during the proposed project.

4.4.2 No-Action Alternative

Under the No-Action Alternative no construction would occur. No adverse impacts are anticipated from this alternative.

4.5 Project Impacts to Noise

4.5.1 Proposed Action

The proposed project area is located at the crossing point of the Santa Ynez River by 13th Street. The Santa Ynez River basin at this location is at approximately the same elevation as the surrounding topographic features. The immediate vicinity is currently undeveloped, apart from single buildings or small groups of buildings (non-residential) at specific locations. Existing noise levels near the project site are low due to the large areas of undeveloped landscape and sparse noise sources. Louder noise levels occur at the intersection of the Santa Ynez River with 13th Street.

Predictions of non-transient noise levels for construction activities associated with the emergency repair and the proposed retrofit were developed for distances up to 1000 feet (Table 4-5). As sound travels further away from its source, the sound level decreases. This is called the attenuation rate. The rate used in these estimates was a decrease in level of 4.5 dB per doubling of distance. This average rate has been shown to be an accurate estimate from field data on grassy surfaces (Harris 1998). To place noise levels in perspective, a food blender at a distance of 3 feet generates 90 dBA (decibels on the A-weighted). Riding an automobile at 40 miles per hour produces approximately 75 dBA. Normal speech is approximately 60 dBA. Disturbances from elevated L_{eq1H} noise levels near the project area would be temporarily elevated during equipment operation.

Table 4-5. L_{eq1h} noise levels as a result of continuous construction activities.

Distance from Construction Area (feet)	Emergency Repair L_{EQ} (dB)	Proposed Retrofit L_{EQ} (dB)
50	94.5	99.9
100	90.0	95.4
300	82.8	88.2
500	79.5	84.9
1000	75.0	80.4

Some construction activities produce noises that are more transient in nature and therefore are not best described by the L_{eq1h} metric. Several types of activities were found to create transient noises, mainly associated with collisions between construction equipment and rocks. These activities include front-end loaders picking up rock, loading rock into delivery trucks, and unloading of rock by delivery trucks. Noise measurements were performed with a Larson Davis 820 sound level meter to measure L_{max} values. The same attenuation rate of 4.5

dB per doubling of distance was used to predict transient noise levels of distances up to 1000 feet (Table 4-6).

Table 4-6. Lmax noise levels of transient construction activities

Distance from Construction Area (feet)	Emergency Repair L_{EQ} (dB)	Temporary Shoring Project L_{EQ} (dB)	Proposed Retrofit L_{EQ} (dB)
50	94.5	89.7	99.9
100	90.0	85.2	95.4
300	82.8	80.7	88.2
500	79.5	74.7	84.9
1000	75.0	70.2	80.4

4.5.2 No-Action Alternative

There would be no construction activities associated with the implementation of the No-Action Alternative. Therefore, noise levels within the project area would not be affected.

4.6 Project Impacts to Earth Resources

Factors considered during evaluation of the environmental consequences of the Proposed Action and the No-Action Alternative on earth resources include seismicity, structural damage, tsunamis, surface fault ruptures, and liquefaction. These hazards have the potential to cause significant damage to the existing bridge structure even after completion of the retrofit work. Based on a review of the documentation available on the geological characteristics and seismic activity of the region, no environmental impacts on geology and soils are anticipated from the implementation of the Proposed Action, the No-Action Alternative. No cumulative impacts are anticipated when considering the full replacement of the bridge anticipated to occur within the next five years.

4.7 Project Impacts to Land Use

Factors considered in the evaluation of the environmental consequences of implementing the Proposed Action and the No-Action Alternative for land use include:

- restriction to development of facilities on Vandenberg AFB;
- public accessibility to recreational areas in the vicinity of Vandenberg AFB;
- public accessibility to AMTRAK passenger service out of Surf Station; and
- the potential for a decrease in available agricultural lands near the project area.

4.7.1 Proposed Action

No adverse environmental consequences are expected to occur on land use resources as a result of the Proposed Action. During the emergency repair, traffic was regulated to reduce speed on 13th Street through the construction area. Construction activities during this emergency repair also resulted in temporary delays while clearing the roadway of construction traffic. During the proposed retrofit, the section of 13th Street at the Santa Ynez River would be closed to through traffic for the duration of the project (five months) to allow equipment access to the bridge deck for construction purposes. All vehicle traffic to and from base would be rerouted through Pine Canyon Road and the Lompoc Gate, and California Street and the Main Gate. However, neither of these traffic restrictions is expected to interfere with development of facilities on Vandenberg AFB, or public access to recreational areas or AMTRAK passenger service out of Surf Station. The use of open space near the northern approach to the bridge as construction staging areas are not expected to result in a decrease in available agricultural lands.

In accordance with the Coastal Zone Management Act (CZMA), Vandenberg AFB will submit a Negative Determination to the California Coastal Commission (CCC) and request concurrence prior to initiation of the proposed retrofit.

4.7.2 No-Action Alternative

Under the No-Action Alternative, no restrictions to vehicle traffic would occur, thus, no environmental consequences would be expected to occur to land use resources.

However, in the event of a bridge collapse, traffic would be forcibly diverted to other roads, and result in an interruption of mission essential transportation between North and South Vandenberg AFB. In addition, such a situation would result in a fast track reconstruction project involving intensive construction activities. Such an action could affect the agricultural lands near the northern approach to the bridge, to accommodate the construction staging areas.

4.8 Project Impacts to Human Health and Safety

Several known health and safety issues occur at the project site, located in the Santa Ynez River at the intersection with 13th Street.

- The project site in the floodplain and specifically within the riverbed of the Santa Ynez River, which is prone to flooding during significant rain events.
- Physical hazards, including holes or ditches, uneven terrain, sharp or protruding objects, slippery soils or mud, quicksand, steep grades, and unstable ground are or could be present at the project site.
- Biological hazards, including vegetation (i.e., poison oak and stinging nettle), animals (i.e., insects, spiders, and snakes), and disease vectors (i.e., ticks, rodents) exist at and around the project site.

Worker safety requirements are addressed under OSHA and AFOSH regulations. Government workers are required to comply with the more stringent of OSHA or AFOSH directives. Therefore, the effects of the Proposed Action, as they relate to the safety of workers employed for construction and operational activities, are outside the purview of this document and were not examined.

4.8.1 Proposed Action

The construction contractor would comply with OSHA and AFOSH regulations, and other recognized standards for operations that involve construction. Access to the proposed construction site would be restricted through use of signs and fencing. The construction contractor would also provide for the health and safety of workers and all subcontractors who may be exposed to their operations or services. During performance of work, the contractor would comply with all provisions and procedures prescribed for the control and safety of construction team personnel and visitors to the job site.

The Proposed Action would result in no health and safety impacts, assuming regulatory compliance.

4.8.2 No-Action Alternative

Under the No-Action Alternative, construction would not occur and there would be no health and safety impacts resulting from construction activities. However, if the bridge were to collapse, access to North Vandenberg AFB from Highway 246 would be impeded. This would be an adverse impact to health and safety at Vandenberg AFB, since emergency vehicle access would be limited to Pine Canyon Road and California Avenue.

4.9 Project Impacts to Hazardous Materials and Hazardous Waste

4.9.1 Proposed Action

Hazardous materials primarily in the form of petroleum, oil and lubricants (POL) will be used for construction equipment. The use of standard spill prevention procedures would ensure that no adverse impacts occur on the environment. Hazardous materials used and/or generated during the bridge retrofit itself would include compressed ignitable gases, asphalt-concrete chemical primers, curing agents and stabilizers, and various surface coatings. The presence of these materials poses an environmental and human health risk. Management requirements are described as minimization measures in Section 4.9.4.

Hazardous wastes generated by construction will be properly contained, stored, and disposed. If small amounts are generated, the waste will be removed from the site within 24 hours and process through the Vandenberg AFB consolidated collection accumulation facility at Building 6830. If bulk hazardous wastes are produced, they will be removed from the site within established regulatory time frames, not to exceed 90 days.

4.9.2 No-Action Alternative

Under the No-Action Alternative, no construction activities would occur. The No-Action Alternative would create no additional hazardous materials or waste. Therefore, no impacts to hazardous materials or waste management would occur.

4.10 Project Impacts to Solid Waste

4.10.1 Proposed Action

Solid waste generated over the duration of the 13th Street Bridge Project would include packaging from materials (cardboard and plastic), scrap rebar, and miscellaneous waste generated by onsite construction workers. The contractor would be responsible for the disposal and/or recycling of all waste generated during the scope of the project. Miscellaneous unrecyclable wastes generated during demolition and construction will be disposed of off-base by the contractor. Soils removed from the project site would be transported to a designated site. Falsework used during the project would be reused or recycled by the contractor. Therefore, the Proposed Action would have no adverse impacts on solid waste management at Vandenberg AFB.

4.10.2 No-Action Alternative

Under the No-Action Alternative, no construction activities would occur. Therefore, under the No-Action Alternative there would be no waste generated and there would be no impact on solid waste management.

4.11 Project Impacts to Pollution Prevention

4.11.1 Proposed Action

The construction operations of the Proposed Action would create pollution in the air and water and would generate hazardous and solid waste. Compliance with the Vandenberg AFB PPMP and implementation of the recommended measures for air quality, hazardous waste management, and solid waste management (Sections 4.3, 4.9, and 4.10) would enhance pollution prevention. In addition, the construction contractor should use

environmentally preferred materials and processes when feasible. Reuse of processed concrete would decrease pollution that would otherwise be generated by using raw materials or having to transport the processed material off base for reuse. Transport of materials off base would also create air emissions and would use non-renewable resources such as gasoline and other petroleum based products.

4.11.2 No-Action Alternative

Under the No-Action Alternative construction work would not occur. The use or purchase of environmentally preferred constructions materials would not be necessary. Therefore, there would be no impacts to pollution prevention under the No-Action Alternative.

4.12 Project Impacts to Socioeconomics

4.12.1 Proposed Action

The 13th Street Bridge retrofit repair project is expected to employ approximately 20 to 25 construction workers for a period of approximately five months. Vandenberg AFB is expected to use contractors already employed for this type of construction activity. Since the effort for this project is small, it is anticipated that all work would be accomplished by already employed personnel working the local or nearby areas.

4.12.2 No-Action Alternative

Under the No-Action Alternative construction work would not occur. Therefore, the No-Action Alternative would not affect socioeconomics.

4.13 Project Impacts to Environmental Justice

An adverse impact to environmental justice would occur if:

- There was an adverse impact to the natural or physical environment or to health that affected a minority or low-income population or children;
- There was an adverse environmental impact on minority or low-income populations or children that appreciably exceeded those on the general population or other comparison group;
- The risk or rate of environmental hazard exposure by a minority or low-income population was significant and exceeded those on the general population or other comparison group; or
- A health or environmental effect occurred in a minority or low-income population affected by cumulative or multiple adverse exposures from environmental hazards.

4.13.1 Proposed Action

The project area of the 13th Street Bridge repair, enforcement and retrofit is located at the intersection of 13th Street with the Santa Ynez River on Vandenberg AFB. No minority or low-income populations reside within this area and the project is not expected to have any environmental consequences for minorities or low-income populations or communities.

4.13.2 No-Action Alternative

Under the No-Action Alternative construction work would not occur. Therefore, the No-Action Alternative would not affect environmental justice.

4.14 Cumulative Impacts

Cumulative effects result from the incremental effect of an action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

A full replacement of the 13th Street Bridge over the Santa Ynez River may occur within the next five years. However, no funding for the project has been authorized or appropriated. In addition, no plans have been developed for the bridge and no decision has been made regarding the potential location of the bridge. As a result, the potential impacts of the future bridge cannot be assessed. If construction of a new bridge is authorized, the project will undergo appropriate environmental analysis.

The full replacement of the bridge would entail the removal of the existing structure and the construction of a new structure that would span at a minimum the 500 feet length of the riverbed. While it is too early to assess the environmental impacts on biological resources of a project of such magnitude, adverse impacts to sensitive habitats and special status plant and wildlife species are foreseeable as a result of disturbances, losses, and other potential take situations. These impacts are likely to occur due to construction related activities including noise generated by construction equipment and personnel, construction activities within the riparian corridor and the riverbed, and modification and removal of habitat.

A separate cultural resources study should be conducted for the environmental documentation prepared for the full replacement of the 13th Street Bridge.

Noise levels generated by construction activities associated with implementation of the Proposed Action would be a temporary, short-term occurrence. Since ambient noise levels at the project site are relatively low, no cumulative impacts are anticipated to occur.

Because of the short-term nature of land use restrictions associated with the Proposed Action, no cumulative impacts are expected to occur on land use resources.

No cumulative impacts are anticipated to occur on water resources, air quality, earth resources, land use, human health and safety, hazardous materials and hazardous waste, solid waste, pollution prevention, socioeconomics, and environmental justice, when considering a full replacement of the bridge within the next five years.

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Final
Environmental Assessment

13th Street Bridge
Emergency Repair and Retrofit

Vandenberg Air Force Base
California

Bibliography

Bibliography

Alterman, I.B., R.B. McMullen, L.S. Cluff, and D.B. Slemmons (eds). 1994. Seismotectonics of Central California Coast Ranges. Geological Society of America Special Paper 292.

Arnold, J.E. 1991. Transformation of a Regional Economy: Sociopolitical Evolution and the Production of Valuables in Southern California. *American Antiquity* 56:953–962.

Arnold, J.E. 1992. Complex Hunter-Gatherer-Fishers of Prehistoric California: Chiefs, Specialists, and Maritime Adaptations of the Channel Islands. *American Antiquity* 57:60–84.

Basgall, M.E. 1987. Resource Intensification Among Hunter-Gatherers: Acorn Economies in Prehistoric California. *Research in Economic Anthropology* 9:21–52.

Bergin, K.A., and C.D. King. 1989. *The Survey and Inventory of Archaeological Properties for the Backbone Fiber-Optic Transmission System Project, Vandenberg Air Force Base, Santa Barbara County, California.* Environmental Solutions, Inc., Irvine, California. Prepared for Department of the Air Force, Headquarters Space Systems Division, Department of Environmental Planning, El Segundo, California. (VAFB-1989-12).

Berry, S. 1988. *Santa Ynez Waterline Surface Survey, Raw Waterline Placement Project, Santa Ynez River, County of Santa Barbara.* On file, Central Coastal Information Center, California Historical Resources Information System, University of California, Santa Barbara (VAFB-1988-11).

Blackburn, T.C. 1975. *December's Child: A Book of Chumash Oral Narratives.* University of California Press, Berkeley.

Bolton, H.E. (editor). 1926. *Historical Memoirs of New California by Fray Francisco Palou, O.F.M.*, vol. 2. University of California Press, Berkeley.

Bolton, H.E. 1931. *Font's Complete Diary . . . 1775–1776*. University of California Press, Berkeley.

Bowser, B, S. Dondero, H. Macfarlane, J. Rudolph, and C. Woodman. 1986. *Phase II Archaeological Investigations and Mitigation Planning, Union Oil Company of California, Santa Maria Basin Pipeline (Platform Irene Project), Santa Barbara California.* URS Corporation, Santa Barbara, California. Prepared for Union Oil Company of California, Orcutt. Submitted to Vandenberg Air Force Base, Santa Barbara County, California (VAFB-1986-02).

Breschini, G.S., and T. Haversat. 1988. *Archaeological Investigations at CA-SLO-99, Pismo Beach, San Luis Obispo County, California.* Coyote Press Archives of California Prehistory 26.

Breschini, G.S., T. Haversat, and R.P. Hampson. 1983. *A Cultural Resources Overview of the Coast and Coast-Valley Study Areas.* Coyote Press, Salinas, California.

Cagle, C. 1995. *Archaeological Survey Report for the Repair of the 13th Street Waterline (XUMU 89-0082).* Science Applications International Corporation, Santa Barbara, California. Submitted to the Department of the Air Force, Vandenberg Air Force Base, California.(VAFB-1995-05).

California Department of Finance, Economic Research. 2001. Financial and Economic Data, California County Profiles. Santa Barbara County Profile. February 2001. Retrieved December 13, 2002 from World Wide Web http://www.dof.ca.gov.

California Department of Finance, Economic Research. 2001. Financial and Economic Data, California Demographic Data, Counties and Cities. Retrieved December 13, 2002 from World Wide Web http://www.dof.ca.gov.

California Department of Fish and Game (CDFG). 1999. Special Status Plants, Animals and Natural Communities of Santa Barbara County. California Natural Diversity Data Base.

California Department of Fish and Game (CDFG). 2001. Special Plants and Animals: Surf and Tranquillion Mountain USGS Quadrangles. California Natural Diversity Data Base.

California Department of Fish and Game (CDFG). 2002a. State and federally listed endangered, threatened, and rare plants of California. California Natural Diversity Database.

California Department of Fish and Game (CDFG). 2002b. California Wildlife Habitats Relationships System Version 8.0 personal computer program. California Interagency Wildlife Task Group, Sacramento, California.

California Department of Fish and Game (CDFG). 2002a. State and federally listed endangered, threatened, and rare plants of California. California Natural Diversity Database.

California Department of Fish and Game (CDFG). 2003. Special Animals. Department of Fish and Game Wildlife and Habitat Data Analysis Branch. California Natural Diversity Database. Retrieved from http://www.dfg.ca.gov/hcpb/species/lists.shtml on February 12, 2003. 45 pp.

Carbone, L.A., and R.D. Mason. 1998. *Phase I, II, and III Archaeological Surveys for Cultural Resources Inventory, Vandenberg Air Force Base, Santa Barbara County, California.* Science Applications International Corporation and Chambers Group, Inc., Santa Barbara, California. Submitted to the Western Region Interagency Archeological Services Branch, National Park Service. (VABF 1998-03)

Christopher, S.V. 1996. Reptiles and amphibians of Vandenberg Air Force Base, Santa Barbara County, California. Museum of Systematics and Ecology, Report No. 4, University of California, Santa Barbara, in cooperation with the National Biological Service, San Simeon.

Christopher, S.V. 2002. Sensitive amphibian inventory at Vandenberg Air Force Base, Santa Barbara County, California. Summary of preliminary results and site maps. Appendix A Field survey data January 1995 through March 2002.

Clark, M.E. 1997. *Archaeological Surveys around Septic Systems at Various Facilities, Vandenberg Air Force Base, Santa Barbara County, California*. Tetra Tech, Inc., Santa Barbara, California, and Applied EarthWorks, Inc., Fresno, California. Submitted to 30 CES/CEV, Vandenberg Air Force Base, California, USAF Contract No. F04684-95-C-0045, Work Request No. 1.

Cook, S.F. 1976. *The Population of California Indians, 1769–1770*. University of California Press, Berkeley.

Coulombe, H.N., and C.R. Mahrdt. 1976. Ecological assessment of Vandenberg Air Force Base, California. Vol. II: Biological Inventory 1974/75. Prepared for: U.S. Air Force, Headquarters, Space and Missile Systems Org., Air Force Systems Command, Los Angeles Air Force Station, California. Prepared by: San Diego State University, Center for Regional Environmental Studies. 199 pp.

County of Santa Barbara (CSB). 2000. Final North County Siting Study, County of Santa Barbara Planning & Development Department Energy Division. October 2000.

County of Santa Barbara (CSB). 2002. Final Environmental Impact Report, Tranquillon Ridge Oil and Gas Development Project LOGP Produced Water Treatment System Project Sisquoc Pipeline Bi-Directional Flow Project. Prepared by Arthur D. Little, MRS, and SAIC. County of Santa Barbara Planning and Development. June 2002.

Davis, S., H. Parreira and D. Bastian. 2003. Site Visit/Monitoring Summary, December 21, 2002-January 3, 2003, 13th Street Bridge Emergency Stabilization. Prepared for ACE Engineering, Inc. On file, Applied EarthWorks Inc., 515 E. Ocean Avenue, Lompoc, California 93436.

Denardo, C. 1998. *Final Archaeological Monitoring for Septic System Installation at Buildings 51 and 1200, Vandenberg Air Force Base, Santa Barbara County, California.* Applied EarthWorks, Inc., Fresno, California. Submitted to 30 CES/CEV, Vandenberg Air Force Base, California.

Dibblee Jr., T.W. 1950. Geology of the southwestern Santa Barbara County, California. California Division of Mines Bulletin 150.

Earle, D.D., and J.R. Johnson. 1999. *Draft Technical Report: Chumash Ethnohistoric and Ethnographic Overview of Sacred and Traditional Sites, Vandenberg Air Force Base.* Chambers Group. Submitted to the U.S. Department of the Interior, National Park Service, Western Region, Interagency Archaeological Services Branch. Contract 1443 CX 8000-92-010, Delivery Order CX 8006-92-010.

Earth Technology Corporation, The (TETC). 1985. *Archaeological Test Excavation and Monitoring at SBa-939, SBa-512, and SBa-1853, Vandenberg Air Force Base, California.* The Earth Technology Corporation, Seattle, Washington. Submitted to Air Force Regional Civil Engineer, Norton Air Force Base, California. (VAFB-1984-12).

Engelhardt, Z. 1933. *Mission San Luis Obispo in the Valley of the Bears*. Mission Santa Barbara, Santa Barbara, California.

Engineering Science. 1994. *Cultural Resources Assessment of the Titan Fiber Optic Transmission System, Vandenberg Air Force Base, Santa Barbara County, California.* On file, 30 CES/CEVPC, Vandenberg Air Force Base, California (VAFB-1994-28).

Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1, U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississipi.

Erlandson, J., T. Cooley, and R. Carrico. 1987. A Fluted Projectile Point Fragment from the Southern California Coast: Chronology and Context at CA-SBA-1951. *Journal of California and Great Basin Anthropology* 9:120–128.

Erlandson, J.M. 1984. *A Summary of Phase I Cultural Resource Investigations Conducted in Support of the Proposed Union Oil/Santa Maria Basin Pipeline.* Social Process Research Institute, University of California, Santa Barbara. Submitted to HDR Systems, Santa Barbara, California. (VAFB-1984-11).

Erlandson, J.M. 1991. Early Maritime Adaptations on the Northern Channel Islands. In *Hunters and Gatherers of Early Holocene Coastal California*, edited by J. M. Erlandson and R. Colten, pp. 101–111. Perspectives in California Archaeology, vol. 1. Institute of Archaeology, University of California, Los Angeles.

Erlandson, J.M. 1994. *Early Hunter-Gatherers of the California Coast.* Plenum, New York.

Erlandson, J.M. 1997. The Middle Holocene on the Western Santa Barbara Coast. In *Archaeology of the California Coast During the Middle Holocene*, edited by J. M. Erlandson and M. A. Glassow, pp. 91–109. Perspectives in California Archaeology, vol. 4. Institute of Archaeology, University of California, Los Angeles.

Erlandson, J.M., and K. Bartoy. 1995. Cabrillo, the Chumash, and Old World Diseases. *Journal of Great Basin Anthropology* 17:153–173.

Erlandson, J.M., and K. Bartoy. 1996. Protohistoric California: Paradise or Pandemic? *Proceedings of the Society for California Archaeology* 9:304–309.

Fages, P. 1937. *A Historical, Political, and Natural Description of California by Pedro Fages, Soldier of Spain.* Translated by H. I. Priestly. University of California Press, Berkeley.

Fiedel, S.J. 1999. Older Than We Thought: Implications of Corrected Dates for Paleoindians. *American Antiquity* 64:95–115.

Fitzgerald, R.T. 1998. *The Ground stone Assemblage of the Cross Creek Site (CA-SLO-1797): A Reexamination of the Milling Stone Horizon in Central California.* Paper presented at 32nd Annual Meeting of the Society for California Archaeology, San Diego.

Foster, J.M. 1985. *Archaeological Investigation: Onshore Portion for Point Pedernales Pipeline Project, Santa Barbara County, California* (VAFB-1985-28). Greenwood and Associates, Pacific Palisades, California. Prepared for Dames & Moore, Santa Barbara, California. (VAFB-1985-28).

Gard, H. A., N. A. Cadoret, and J. C. Chatters. 1990. *Cultural Resources Monitoring Report: Phase I and II, Backbone Fiber Optics Transmission System Construction, Vandenberg Air Force Base, California*. Prepared for Battelle Northwest Laboratory Environmental Management Office. On file, 30 CES/CEVPC, Vandenberg Air Force Base, California. (VAFB-1990-10)

Gibson, R.O. 1985b. Field Notes and Field Maps Compiled during the Union Oil Project, Archaeological Surface Survey and Limited Subsurface Testing Done along the Proposed Routes, Santa Barbara County, California. On file, 30 CES/CEVPC, Vandenberg Air Force Base, California (VAFB-1985-27).

Gibson, R.O. 1984. *Results of Archaeological Surface Survey on Three Parcels of Land Totalling 234 Acres on Vandenberg Air Force Base*. Robert O. Gibson, Archaeologist, Paso Robles, California. Submitted to URS Corporation, Santa Barbara, California (VAFB-1984-21).

Gibson, R.O. 1985a. *Summary of Archaeological Monitoring for the Northern and Southern Mitigating Routes for the Union Oil Pipeline, Vandenberg Air Force Base, California.* On file, 30 CES/CEVPC, Vandenberg Air Force Base, California (VAFB-1985-10).

Gibson, R.O. 1986. *Results of Archaeological Surface Survey for a Fence Improvement Project Near Highway 246, Vandenberg Air Force Base, California.* On file, 30 CES/CEVPC, Vandenberg Air Force Base, California (VAFB-1986-14).

Gibson, R.O. 1987. *Results of Archaeological Surface Survey for a Fence Improvement Project and Two Pasture Management Projects, Vandenberg Air Force Base, California.* On file, 30 CES/CEVPC, Vandenberg Air Force Base, California (VAFB-1987-09).

Gibson, R.O., and K. Osland. 1985. *Results of Archaeological Surface Survey for a Proposed Communication Line Near Point Pedernales Southern Vandenberg Air Force Base, California.* On file, 30 CES/CEVPC, Vandenberg Air Force Base, California (VAFB-1985-06).

Glassow, M., and L. Wilcoxon. 1988. Coastal Adaptations near Point Conception, California, with Particular Regard to Shellfish Exploitation. *American Antiquity* 53:36–51.

Glassow, M.A. 1977. *An Intensive Archaeological Survey of Five Areas on Vandenberg Air Force Base, Santa Barbara County, California*. Anthropology Department, University of California, Santa Barbara. Submitted to the USDI National Park Service, Western Region Interagency Archeological Services Branch, San Francisco, Contract No. CX8880-7-0005 (VAFB-1977-01).

Glassow, M.A. 1990. *Archaeological Investigations on Vandenberg Air Force Base in Connection with the Development of Space Transportation System Facilities*. Department of Anthropology, University of California, Santa Barbara. Submitted to USDI National Park Service, Western Region, Interagency Archaeological Services Branch, San Francisco, Contract No. CX-8099-2-0004.

Glassow, M.A. 1996. *Purisime o Chumash Prehistory: Maritime Adaptations Along the Southern California Coast*. Case Studies in Archaeology. Jeffrey Quilter, series editor. Harcourt Brace College Publishers, San Diego.

Glassow, M.A. 1997. Middle Holocene Cultural Development in the Central Santa Barbara Channel Region. In *Archaeology of the California Coast During the Middle Holocene*, edited by J. M. Erlandson and M. A. Glassow, pp. 73–90. Perspectives in California Archaeology, vol. 4. Institute of Archaeology, University of California, Los Angeles.

Glassow, M.A., L. Wilcoxon, and J.M. Erlandson. 1988. Cultural and Environmental Change during the Early Period of Santa Barbara Channel Prehistory. In *The Archaeology of Prehistoric Coastlines*, edited by G. N. Bailey and J. E. Parkington, pp. 64–77. Cambridge University Press, Cambridge.

Glenn, B. 1990. Typological Analysis of Projectile Points. In *Archaeological Investigations on Vandenberg Air Force Base in Connection with the Development of Space Transportation System Facilities,* vol. 2, edited by Michael A. Glassow, pp. A4-1–A4-45. Department of Anthropology, University of California, Santa Barbara. Submitted to the National Park Service, Western Region, Interagency Archeological Services, Contract CX 8099-2-0004.

Glenn, B. 1991. *Typological Analysis of Projectile Points Recovered from Excavation on Vandenberg Air Force Base, Santa Barbara County, California.* Unpublished Master's thesis, University of California, Santa Barbara.

Grant, C. 1978a. Interior Chumash. In *California*, edited by Robert F. Heizer, pp. 530–534. Handbook of North American Indians, vol. 8, William C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Grant, C. 1978b. Chumash: Introduction. In *California*, edited by R. F. Heizer, pp. 505–508. Handbook of North American Indians, vol. 8, W. C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Grant, C. 1978c. Island Chumash. In *California,* edited by R. F. Heizer, pp. 524–529. Handbook of North American Indians, vol. 8, W. C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Grant, C. 1978d. Eastern Coastal Chumash. In *California,* edited by R. F. Heizer, pp. 509–519. Handbook of North American Indians, vol. 8, W. C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Greenwood, R.S. 1972. *9000 Years of Prehistory at Diablo Canyon, San Luis Obispo County, California.* San Luis Obispo County Archaeological Society Occasional Paper No. 7.

Greenwood, R.S. 1978. Obispe o and Purisime o Chumash. In *California*, edited by Robert F. Heizer, pp. 520–523. Handbook of North American Indians, vol. 8, W. C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Greenwood, R.S., and J.M. Foster. 1984. *Replacement Cable Project and Fibre Optic Cable Project, Vandenberg Air Force Base, Santa Barbara County, California.* Greenwood and Associates, Pacific Palisades, California. Submitted to the U.S. Air Force, Space and Missiles Center, Vandenberg Air Force Base, California (VAFB-1984-12).

Harris, C.M. 1998. Handbook of acoustical measurements and noise control. Third edition. McGraw Hill. New York, New York.

Harro, D.R., and C. Ryan. 1997. *Archaeological Boundary and National Register Eligibility Testing for the Septic Systems Repair Project, Vandenberg Air Force Base, California.* Applied EarthWorks, Inc., Fresno, California, for Tetra Tech, Inc., Santa Barbara, California. Submitted to 30 CES/CEV, Vandenberg Air Force Base, California, USAF Contract No. F04684-95-C-0045.

Haslouer, L., and D. Kay. 1996. *Archaeological Survey Report, U.S. Penitentiary's San Antonio Grazing Unit Fence Construction, Vandenberg Air Force Base, Santa Barbara County, California.* Prepared for Environmental management Office, 30 SW/ET, 806 13th Street, Suite 116, Vandenberg AFB, California. Submitted by Science Applications International Corporation, 816 State Street, Suite 500, Santa Barbara, California. (VAFB 1996-09).

Hickman, J.C. (ed.). 1993. The Jepson manual. Higher plants of California. University of California Press, Berkeley. 1400 pp.

Holland, V.L. and D.J. Keil. 1995. California vegetation. Kendall/Hunt Publishing Company. Dubuque. 516 pp.

Holmgren, M.A., and P.W. Collins. 1999. Final report on the distribution and habitat associations of six bird species of special concern at Vandenberg Air Force Base, Santa Barbara County, California. Prepared for Vandenberg Air Force Base, 30CES/CEVPN, Natural Resources, Vandenberg Air Force Base, California. Santa Barbara Museum of Natural History Monographs No. 1, Studies in Biodiversity No. 1. 204 pp.

Hudson, D. T., and E. Underhay. 1978. *Crystals in the Sky: An Intellectual Odyssey Involving Chumash Astronomy, Cosmology, and Rock Art.* Ballena Press Anthropological Papers 10. Socorro, New Mexico.

Hudson, D. T., T. Blackburn, R. Curletti, and J. Timbrook (editors). 1977. *The Eye of the Flute: Chumash Traditional History and Ritual, as told by Fernando Librado Kitsepawit to John P. Harrington.* Malki Museum Press, Banning.

Hudson, D.T., and T.C. Blackburn. 1982. *Food Procurement and Transportation.* The Material Culture of the Chumash Interaction Sphere, vol. I. Ballena Press Anthropological Papers No. 25. Ballena Press/Santa Barbara Museum of Natural History Cooperative Publication, Los Altos and Santa Barbara, California.

Hudson, D.T., and T.C. Blackburn. 1985. *Clothing, Ornamentation, and Grooming.* The Material Culture of the Chumash Interaction Sphere, vol. III. Ballena Press Anthropological Papers No. 28. Menlo Park, California.

Hudson, D.T., and T.C. Blackburn. 1986. *Ceremonial Paraphernalia, Games, and Amusement.* The Material Culture of the Chumash Interaction Sphere, vol. IV. Ballena Press Anthropological Papers No. 30. Menlo Park, California.

Hunt, L.E. 1990. Aquatic and terrestrial vertebrates in the Santa Ynez River system potentially affected by flood control practices west of Lompoc, Santa Barbara County, California. Prep. For SB County Flood Control District and Dames & Moore, Goleta, California. 33 pp.

Ingles, L.G. 1965. Mammals of the Pacific states. Stanford University Press, Stanford. 506 pp.

Jennings, C.W. 1994. Fault map of California and adjacent areas. California Division of Mines and Geology. California Geological Data Map Series, Map No. 6, Scale 1:750,000.

Johnson, J.R. 1988. *Chumash Social Organization: An Ethnohistoric Perspective*. Ph.D. dissertation, Department of Anthropology, University of California, Santa Barbara.

Jones, T.L., and G. Waugh. 1995. *Central California Coastal Prehistory: A View from Little Pico Creek*. Perspectives in California Archaeology, vol. 3. Institute of Archaeology, University of California, Los Angeles.

Jones, T.L., K. Davis, G. Farris, S.D. Grantham, T.W. Fung, and B. Rivers. 1994. *Towards a Prehistory of Morro Bay: Phase II Archaeological Investigations for the Highway 41 Widening Project, San Luis Obispo County, California*. Submitted to the California Department of Transportation, Environmental Branch, San Luis Obispo, California.

Kennett, D.J. 1998. *Behavioral Ecology and the Evolution of Hunter-Gatherer Societies on the Northern Channel Islands, California*. Ph.D. dissertation, Department of Anthropology, University of California, Santa Barbara.

King, C.D. 1981. *The Evolution of Chumash Society: A Comparative Study of Artifacts Used in Social System Maintenance in the Santa Barbara Channel Region Before A.D. 1804*. Ph.D. dissertation, Department of Anthropology, University of California, Davis. University Microfilms, Ann Arbor, Michigan.

King, C.D. 1984. Ethnohistoric Background. In *Archaeological Investigations on the San Antonio Terrace, Vandenberg Air Force Base, California, in Connection with MX Facilities Construction*, pp. I-1–I-54. Chambers Consultants and Planners, Stanton, California. Submitted to the U.S. Army Corps of Engineers, Los Angeles District, Contract No. DAC09-81-C-0048.

King, C.D. 1990. *Evolution of Chumash Society: A Comparative Study of Artifacts Used for Social System Maintenance in the Santa Barbara Channel Region Before A.D. 1804*. Garland, New York.

King, C.D., R.O. Gibson, J. Hunter, M.K. Martin, L. Roberts, and L.R. Wilcoxon. 1985. Cultural Resources. In *Union Oil Project/Exxon Project Shamrock and Central Santa Maria Basin Area Study EIS/ EIR*, Technical Appendix G. Prepared for County of Santa Barbara U.S. Minerals Management Service, California State Lands Commission, California Office of Offshore Development. Submitted by Arthur D. Little, Inc., Santa Barbara, California. (VAFB-1985-25).

Landberg, L. 1965. *The Chumash Indians of Southern California*. Southwest Museum Papers No. 19. Los Angeles.

Lebow, C.G. 2001. Appendix B - Cultural Resources. In *Final Environmental Assessment, Power Line Modifications and Encapsulated Payload Transport, Vandenberg Air Force Base, California.* Submitted to the Department of the Air Force 30th Space Wing Environmental Flight, 21 September 2001. Prepared by SRS Technologies Systems Development Division, Lompoc, California. USAF Contract No. T0900DF415. On file, Applied EarthWorks Inc., 515 E. Ocean Avenue, Lompoc, California 93436.

Lebow, C.G., and D.R. Harro. 1998. *Plant Processing on the San Antonio Terrace: Archaeological Investigations at CA-SBA-2767.* Applied EarthWorks, Inc., Fresno, California. Draft submitted to Central Coast Water Authority, Buellton, California.

Lebow, C.G., and M.J. Moratto. 2001. *Draft Integrated Cultural Resources Management Plan, Vandenberg Air Force Base, Santa Barbara County, California, Vol. 5: Management of Prehistoric Archaeological Resources,* edited by Michael J. Moratto. Tetra Tech, Inc., Santa Barbara, California, and Applied EarthWorks, Inc., Fresno, California. Submitted to 30 CES/CEV, Vandenberg Air Force Base, California. USAF Contract No. F04684-95-C-0045, Work Request 14.

Lehman, P.E. 1994. The birds of Santa Barbara County, California. Vertebrate Museum, University of California, Santa Barbara. 337 pp.

Martin Marietta Corporation. 1985. *Environmental Surveillance Report, No. 20, October 1, 1984 through August 15, 1985.* On file, 30 CES/CEVPC, Vandenberg Air Force Base, California. Filed on a separate shelf for surveillance reports (VAFB-1985-09).

McGinnis, S.M. 1984. Freshwater fishes of California. University of California Press. Berkeley. 316 pp.

McKim, R., and B.A. Price. 1997. *Final Effects Determination for Archaeological Site CA-SBA-687.* Tetra Tech, Inc., Santa Barbara, California, and Applied EarthWorks, Inc., Fresno, California. Submitted to 30 CES/CEV, Vandenberg Air Force Base, California, USAF Contract No. F04684-95-C-0045.

Moratto, M. J. 1984. *California Archaeology.* Academic Press, New York and London.

Moriarity, J.R., and M. Keistman (translators). 1968. Cabrillo's Log 1542–1543: A Voyage of Discovery (a Summary by Juan Paez*). The Western Explorer* 5(2–3):1–20. Cabrillo Historical Association, San Diego, California.

Munz, P.A. 1974. A flora of Southern California. University of California Press, Berkeley. 1238 pp.

Neff, H. 1982. *Final Report, Vandenberg Air Force Base, California, 1982 Fuels Management Program, Cultural Resources Survey/Evaluation.* Office of Public Archaeology, Social Process Research Institute, University of California, Santa Barbara. Submitted to USDI National Park Service, Interagency Archeological Services Division, San Francisco, in partial fulfillment of Contract No. DX 800-2-0024 (VAFB-1982-06).

Occupational Safety and Health Administration (OSHA). 1996. Occupational Noise Exposure. In Occupational Safety and Health Standards, Occupational Health and Environment Control. OSHA Directorate of Safety Standards, U.S. Department of Labor. 39 FR 23502, June 27, 1974 as amended. Retrieved January 8, 2003 from

Osland, K. 1990. *Inventory Report for the Weather Information Networks System, Vandenberg Air Force Base, California.* 30 CES/CEVP, Vandenberg Air Force Base, California. (VAFB-1990-11).

Oyler, L.D., V.L. Holland, and D.J. Keil. 1995. Rare plants of Vandenberg Air Force Base. Biological Sciences Department, California Polytechnic State University, San Luis Obispo, California. 129 pp.

Palmer, K. 1999. *Central Coast Continuum—From Ranchos to Rockets: A Contextual Historic Overview of Vandenberg Air Force Base, Santa Barbara County, California.* Prepared by Palmer Archaeology and Architecture Associates, Santa Barbara, California. Draft submitted to 30 CES/CEVPC, Vandenberg Air Force Base, California.

Penfield & Smith & Bengal Engineering. (2003). Pre-Final 85% Submittal Repair 13th Street Bridge. Project No. XUMU-04-1064 B Vandenberg Air Force Base.

Penfield & Smith & Bengal Engineering. 2002. Repair 13th Street Bridge study 95% submittal. Santa Barbara, California.

Peter, K., and S. Dondero, editors. 1991. *Western Chumash Prehistory: Resource Use and Settlement in the Santa Ynez River Valley.* Science Applications International Corporation, Santa Barbara, California. Prepared for the Unocal Corporation. Submitted to the U.S. Army Corps of Engineers, Los Angeles District. (VAFB-1991-07).

Peterson, R., J.D. Moore, and R.H. Colten. 1984. *Phase I Archaeological Survey of a Proposed Powerline Right-of-Way and Two Alternative Pipeline Routes, Lompoc, California.* On file, Central Coastal Information Center, California Historical Resources Information System, University of California, Santa Barbara. (VAFB-1984-31).

Pierson, E.D., P.W. Collins, W.E. Rainey, P.A. Heady, and C.J. Corben. 2002. Distribution, status and habitat associations of bat species on Vandenberg Air Force Base, Santa Barbara County, California. Santa Barbara Museum of Natural History Technical Reports – No. 1.

Preston, W. 1996. Serpent in Eden: Dispersal of Foreign Diseases into Pre-Mission California. *Journal of California and Great Basin Anthropology* 18(1):2–37.

Raab, L. M., K. Bradford, J. F. Porcasi, and W. J. Howard. 1995. Return to Little Harbor, Santa Catalina Island, California: A Critique of the Marine Paleotemperature Model. *American Antiquity* 60:287–308.

Raab, L.M., and D.O. Larson. 1997. Medieval Climatic Anomaly and Punctuated Cultural Evolution in Coastal Southern California. *American Antiquity* 62:319–336.

Remsen Jr., J.V. 1978. Bird species of special concern in California. Calif. Dep. Fish and Game, Sacramento. Wildl. Manage. Admin. Rep. No. 78-1. 54pp.

Reynolds, Smith and Hill, Inc. (Reynolds et al). 1985. Phase I problem identification and records search, Vandenberg Air Force Base, Installation Restoration Program. Jacksonville, Florida.

Rogers, D.B. 1929. *Prehistoric Man of the Santa Barbara Coast, California*. Santa Barbara Museum of Natural History, Special Publications No. 1.

Romero, N. 1993. Overview of an Effective Management Plan for the Santa Ynez River Watershed with an Emphasis in Restoration of the Steelhead Fishery. B.A. Thesis, University of California, Santa Barbara.

Rudolph, T.P. 1991. Settlement Organization in the Lower Santa Ynez River Valley: 9000 B.P. to Contract. In *Western Chumash Prehistory: Resource Use and Settlement in the Santa Ynez River Valley*, edited by Craig F. Woodman, James L. Rudolph, and Teresa P. Rudolph, pp. 307–338. Science Applications International Corporation, Santa Barbara, California. Prepared for the Unocal Corporation. Submitted to the U.S. Army Corps of Engineers, Los Angeles District.

Santa Barbara County Water Agency (SBCWA). 2000. Water Resources of Santa Barbara County. July 2000.

Science Applications International Corporation (SAIC). 1995. *Final Environmental Assessment, Family Housing Management Office, Vandenberg Air Force Base, California.* Science Applications International Corporation, Santa Barbara, California. Prepared for the U.S. Air Force, Vandenberg Air Force Base, California.

Science Applications International Corporation (SAIC). 2002. Assessment of wetland habitats at the 13th Street Bridge crossing of the Santa Ynez River, Vandenberg AFB, California. Unpub. Report. 8pp + 2 Appendices.

Shipman, G.E. 1972. Soil survey of Santa Barbara County, northern Santa Barbara area. U.S. Department of Agriculture, Soil Conservation Service. Washington D.C.

Shipman, G.E. 1981. Soil survey of Santa Barbara County, south coastal part. U.S. Department of Agriculture, Soil Conservation Service. Washington D.C.

Simpson, L.B. 1939. *California in 1792: The Expedition of Longinos Martinez*. Huntington Library, San Marino, California.

Skinner, M.W., and B.M. Pavlik. 1994. Inventory of rare and endangered vascular plants of California. Fifth Edition. California native Plant Society. Sacramento, California.

Smith, C.F. 1998. A flora of the Santa Barbara region, California. Capra Press, Santa Barbara, 391 pp.

Smith, D.M. 1983. Field study of candidate, threatened or endangered plant species at Vandenberg Air Force Base. Report #11310-0133-81. Submitted to Department of Interior, U.S. Fish and Wildlife Service. Department of Biological Sciences, University of California, Santa Barbara, California. 10pp.

Spanne, L. 1980. *An Archaeological Evaluation of the Space Transportation System 69 kV Transmission Line (V-86), Vandenberg Air Force Base, Santa Barbara County, California*. VTN Consolidated, Inc., Irvine, California. Prepared for The Ralph M. Parsons Company, Pasadena, California. Submitted to 30 CES/CEVPC, Vandenberg Air Force Base, California (VAFB-1980-07).

Spanne, L.W. 1980. *An Archaeological Evaluation of the Space Transportation System 69 kV Transmission Line (V-86), Vandenberg Air Force Base, Santa Barbara County, California*. VTN Consolidated, Inc., Irvine, California. Prepared for The Ralph M. Parsons Company, Pasadena, California. Submitted to 30 CES/CEVPC, Vandenberg Air Force Base, California (VAFB-1980-07).

SRS Technologies (SRS). 2001. Modification of the final rule: Taking and importing marine mammals; Taking marine mammals incidental to rocket launches at Vandenberg Air Force Base, California. 114 pp.

SRS Technologies (SRS). 2003a. Wildlife surveys for 13th Street Bridge project. Unpubl. Report. SRS Technologies, Lompoc, California.

SRS Technologies (SRS). 2003b. Report of monitoring activities for Phase One – Short Term Repairs of the 13th Street Bridge Project. Unpubl. Report. Lompoc, California.

Stebbins, R.C. 1985. Western reptiles and amphibians. Peterson Field Guides. Houghton Mifflin Company. Boston. 336 pp.

Stentson Engineers, Inc. 2002. Twenty-Fourth Annual Engineering and Survey Report on Water Supply Conditions of the San Ynez River Water Conservation District 2001-2002. Santa Ynez River Water Conservation District. 19 April 2002.

Swift, C.C. 2000. Final steelhead habitat evaluation report for Shuman, San Antonio, Honda Canyon, Canada de Jolloru, and Jalama Creeks Vandenberg Air Force Base, California. 48 pp.

Swift, C.C. 2002. Monitoring for steelhead and tidewater gobies, December 21 to 28, 2002. Memorandum to SRS Technologies. December 30, 2002.

Swift, C.C., P. Duangsitti, C. Clemente, K. Hasserd, and L. Valle. 1997. Final Report Biology and distribution of the tidewater goby, *Eucyclogobius newberryi*, on Vandenberg Air Force Base, Santa Barbara County, California. Department of Biology, Loyola Marymount University, Los Angeles, California. 44 pp.

Teggart, F. J. (editor). 1911. The Portolá Expedition of 1769–1770: Diary of Miguel Costansó. *Publications of the Academy of Pacific Coast History* 2(4):164–327.

Tetra Tech, Inc. 1988. *Historic Preservation Plan, San Antonio Terrace National Register District, Vandenberg Air Force Base, California.* Tetra Tech, Inc., San Bernardino, California. Prepared for United States Air Force AFRCE-BMS, Norton Air Force Base, California.

U.S. Air Force (USAF). 1978. Final Environmental Impact Statement, Space Shuttle Program Vandenberg AFB, California, January 1978.

U.S. Air Force (USAF). 1980. Final Environmental Impact Statement, MX: Milestone II (III – Missile Flight Testing).

U.S. Air Force (USAF). 1987. Mineral resource management plan: Potential exploration, development, and production of oil and gas resources, Vandenberg Air Force Base.

U.S. Air Force (USAF). 1988. Environmental Assessment for Titan IV Space Launch Vehicle Modification and Operation, Vandenberg Air Force Base. February 1988.

U.S. Air Force (USAF). 1994. Final Environmental Assessment for the 12-kV Electrical System Upgrade at Vandenberg Air Force Base, California, April 1994.

U.S. Air Force (USAF). 1998. Final environmental assessment for installation of Tranquillion Mountain fiber-optic cable system, Vandenberg Air Force Base, California.

U.S. Air Force (USAF). 2001. Final Environmental Assessment. Power line modifications and encapsulated payload transport Vandenberg Air Force Base, California. Submitted to: Department of the Air Force 30th Space Wing Environmental Flight. Prepared by SRS Technologies Systems Development Division, Lompoc, California. 94 pp.

U.S. Air Force (USAF). 2003. Final Draft Integrated Natural Resources Management Plan, Vandenberg Air Force Base, California. Prepared for: 30 CES/CEV, Vandenberg Air Force Base, California. Prepared by: SRS Technologies, Systems Development Division, Lompoc, California.

U.S. Army Center for Health Promotion and Preventative Medicine (USACHPPM). Report MCHB-AW-P (40-5f). 7 March 1995.

U.S. Forest Service (USFS). 2002. California Watersheds. U.S. Forest Service Pacific Southwest Region. Retrieved from World Wide Web http://www.r5.fs.fed.us/water_resources/html/california_s_watersheds.html on 13 December 2002.

U.S. Geological Survey. 2001. California Hydrologic Data Report, Santa Ynez River at H Street, Near Lompoc, CA. Retrieved from http://ca.water.usgs.gov/archive/waterdata/2001/11134000/html on 7 February 2003.

URS Corporation (URS). 1986. San Miguel project and northern Santa Maria Basin area study – Final environmental impacts statement, Environmental impact report. Prepared for County of San Luis Obispo, Minerals Management Service, State Lands Commission, County of Santa Barbara, California Coastal Commission, and California Office of Offshore Development. October 1986.

Vandenberg Air Force Base (Vandenberg AFB). 2001. 2000 Hazardous waste report. Prepared by 30 CES/CEV Vandenberg Air Force Base. February 2001.

Vandenberg Air Force Base. 1992. *Land Management Plan for Vandenberg Air Force Base, California, for Plan Period 1992 to 1997.* National Resources and Comprehensive Planning Division, Michael McElligott, Ecologist.

Wagner, H.R. 1929. *Spanish Voyages to the Northwest Coast in the Sixteenth Century.* California Historical Society, San Francisco.

Waldron, W. 1988. *Caltrans proposal to Widen Highway 1 from Vandenberg Road to Constellation Road.* On file, Central Coastal Information Center, California Historical Resources Information System, University of California, Santa Barbara. (E-945)

Wallace, W.J. 1978. Southern Valley Yokuts. In *California*, edited by Robert F. Heizer, pp. 448–461. Handbook of North American Indians, vol. 8, W. C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Warren, C.N. 1967. The San Dieguito Complex: A Review and Hypothesis. *American Antiquity* 32:168–185.

WESTEC Services, Inc. 1981. *Geophysical Evaluation, Vandenberg Air Force Base, Santa Barbara County, California, for Union Oil Company of California.* WESTEC Services, Inc., Tustin, California. Submitted to Union Oil Company, Ventura, California (VAFB-1981-04, V-16).

WESTEC Services, Inc. 1985. *Final Report, Archaeological Survey, Testing and Evaluation, STS Power Plant No. 6, Natural Gas Pipeline, Vandenberg Air Force Base, Santa Barbara County, California.* On file, Central Coastal Information Center, California Historical Resources Information System, University of California, Santa Barbara (VAFB-1985-03).

Woodman, C.F., C. Cagle, P. de Barros, and T. Rudolph. 1995. *Final Report, Archaeological Survey and Evaluation of the Honda Beach Site, SBA-530.* Science Applications International Corporation and Chambers Group, Inc., Santa Barbara. Submitted to the National Park Service, Western Region, Interagency Archeological Services Branch, Contract 1443 CX 8000-92-010.

Woodman, C.F., J.L. Rudolph, and T.P. Rudolph (editors). 1991. *Western Chumash Prehistory: Resource Use and Settlement in the Santa Ynez River Valley.* Science Applications International Corporation, Santa Barbara, California. Prepared for the Unocal Corporation. Submitted to the U.S. Army Corps of Engineers, Los Angeles (VAFB-1991-06).

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Appendix A
Acronyms and Abbreviations

Appendix A – Acronyms and Abbreviations

µg	microgram
30th CES	30th Civil Engineering Squadron
30th CES/CECB	30th Civil Engineering Squadron, Base Planning
30th CES/CECC	30th Civil Engineering Squadron, Engineering Contracts
30th CES/CEV	30th Civil Engineering Squadron, Environmental Flight
30th CES/CEVC	30th Civil Engineering Squadron, Water Quality
30th CES/CEVPC	30th Civil Engineering Squadron, Cultural Resources
30th CES/CEVPN	30th Civil Engineering Squadron, Natural Resources
30th SW	30th Space Wing
AASHTO	American Association of State Highway and Transportation Officials
ACOE	U.S. Army Corps of Engineers
AE	Applied EarthWorks, Inc.
AFI	Air Force Instruction
AOC	Area of Concern
AOI	Area of Interest
APE	Area of Potential Effects
BMPs	Best Management Practices
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
Caltrans	California Department of Transportation
CCC	California Coastal Commission
CCIC-UCSB	Central Coast Information Center, University of California, Santa Barbara
CCR	California Code of Regulations
CCRWQCB	Central Coast Regional Water Quality Control Board
CDFG	California Department of Fish and Game
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CISS	Cast-in-steel-shell
CMP	Corrugated metal pipe
CNDDB	California Natural Diversity Data Base
CNPS	California Native Plant Society
CO	Carbon monoxide
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
dB	Decibels
dBA	Decibels on the A-weighted scale
DGPS	Differential Global Positioning System
DOD	Department of Defense
DOT	Department of Transportation
EA	Environmental Assessment

EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
EPA-17	Environmental Protection Agency 17
EPCRA	Emergency Planning and Community Right-to-Know Act
gpm	gallons per minute
H_2S	Hydrogen sulfide
Hazmart	Hazardous Materials Pharmacy
HDPE	High density polyethylene
HSWA	Hazardous and Solid Waste Amendments
IRP	Installation Restoration Program
L_{eq1H}	One-hour average sound level
m^3	Cubic meter
mg/L	Milligrams per liter
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Protection Act
NHPA	National Historic Preservation Act
NO_2	Nitrogen dioxide
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
O_3	Ozone
ODC	Ozone depleting chemicals
OHW	Ordinary High Water
OSHA	U.S. Occupational Safety and Health Administration
P2	Pollution Prevention
Pb	Lead
PM_{10}	Particulate matter 10 microns or less in diameter
$PM_{2.5}$	Particulate matter 2.5 microns or less in diameter
POL	Petroleum, oil and lubricants
PPA	Pollution Prevention Act
Ppm	Parts per million
PPMP	Pollution Prevention Management Plan
RCRA	Resource Conservation and Recovery Amendments
ROC	Reactive organic compound
ROI	Region of Influence
SMBSLR	Santa Maria Basin-San Luis Range
SO_2	Sulfur dioxide
SO_4	Sulfate
SPT	Standard penetration test
SWPPP	Storm Water Pollution Prevention Plan
TSD	Total dissolved solids
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
USC	U.S. Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

UXO	Unexploded ordnance
Vandenberg AFB	Vandenberg Air Force Base
WIS	Wetland Indicator Status

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Appendix B
Waiver for Emergency Repair
Waiver for Temporary Shoring Project

DEPARTMENT OF THE AIR FORCE
WASHINGTON, DC

Office of the Assistant Secretary

MEMORANDUM FOR HQ AFSPC/CE
ATTN: COL CARMODY

20 DEC 2002

FROM: SAF/IEE
1665 Air Force Pentagon
Washington, DC 20330-1665

SUBJECT: Approval for Deviation from Normal Environmental Impact Analysis Procedures (EIAP) at Vandenberg AFB, CA.

I have reviewed your request for approval to deviate from the Air Force's normal EIAP procedures. Based upon the time-critical situation you describe and the potential imminent danger to human safety and the mission at Vandenberg, I approve your request in accordance with AFI 32-7061, *The Environmental Impact Analysis Process*, as promulgated at 32 CFR §989.34(a), Special Procedures, and grant a waiver from normal EIAP processes in accordance with 32 CFR §989.36. Please ensure the following are accomplished:

- Develop and define all best management practices and mitigations to reduce impacts associated with placement of the riprap around the abutment and piers and the use of mechanical equipment working under the bridge;
- Ensure relevant regulatory agency concerns and requirements are incorporated prior to starting work.
- Apprise Headquarters staff of the schedule and status of completion of proposed work to abate the immediate problem; and
- Complete the Environmental Assessment (EA) as soon as reasonably possible, and apprise Headquarters staff of the schedule and status of completion of the EA.

Should you or your staff have further questions regarding this action, my point of contact is Mr. Jack Bush, AF/ILEP, DSN 664-0553.

MAUREEN KOETZ
Deputy Assistant Secretary
of the Air Force
(Environment, Safety, and
Occupational Health)

cc:
AF/ILE
30 SW/CC

DEPARTMENT OF THE AIR FORCE
WASHINGTON DC

OFFICE OF THE ASSISTANT SECRETARY

1 April 2003

MEMORANDUM FOR HQ AFSPC/CE

FROM: 1665 Air Force Pentagon
Washington DC 20330-1665

SUBJECT: Second Request for Waiver of Environmental Impact Analysis Process (EIAP) Requirements for Bridge Stabilization at Vandenberg AFB, CA (VAFB)

I have reviewed your request for approval to deviate from the Air Force's normal EIAP procedures. Based upon the immediate requirement to implement additional stabilization measures at the 13th Street bridge in direct support of a National Reconnaissance Office (NRO) mission need as documented by NRO, I approve your request for deviation in accordance with AFI 32-7061, as promulgated at 32 CFR §989.34(a), *Special Procedures*, and grant a waiver from normal EIAP processes in accordance with 32 CFR §9898.36. This waiver extends only to EIAP requirements; compliance is still required for any applicable environmental law such as the Endangered Species Act and the Clean Water Act.

Over the past 15 years, this office has received requests for only 4 waivers from the NEPA process. The first was in 1991 during Desert Storm and was related to imminent wartime needs. The other three have all been from VAFB in the last two years. Two of those three are in relation to the 13th Street Bridge and have come within the past 3 months. In light of the environmental program disconnects occurring, I would like a briefing from the Wing Commander, no later than 30 April, to explain how the EIAP for the 13th St. Bridge project will be completed.

In our memorandum of 20 December 2002 granting the first NEPA waiver on this proposed action, we specifically requested four separate concerns be addressed and accomplished. The briefing should also address those issues along with any others that must be addressed as a result of this request in support of the NRO mission. Should you or your staff

have further questions with regard to this action, my point of contact is Mr. Jack Bush, HQ USAF/ILEP, (703) 604-5372.

MAUREEN T. KOETZ
Deputy Assistant Secretary
of the Air Force
(Environment, Safety
and Occupational Health)

cc:
AF/ILE
SAF/GCN

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Appendix C
Biological Resources

Appendix C – Biological Resources

This appendix contains lists of plant and wildlife species identified in the surveys and literature as existing or potentially occurring within the impact area for the 13th Street Bridge Retrofit project.

Plant surveys were performed by SAIC (2002) concurrently with the wetlands delineation (see Appendix B) in December 2002. Wildlife surveys were completed by SRS (2003a) in December 2002 and January 2003.

Literature reviewed to assess potential occurrence of species include:

- CNDDB files (CDFG 1999, 2001, 2003)
- Existing local and regional references (Ingles 1965; Munz 1974; Coulombe and Mahrdt 1976; McGinnis 1984; Stebbins 1985; Hickman 1993; Lehman 1994; Holland and Keil 1995; Oyler et al. 1995; USACHPPM 1995; Christopher 1996; Smith 1998; Holmgren and Collins 1999; Swift et al. 1997, Swift 2000; Pierson et al. 2002; USAF 2002)
- Other environmental documents prepared for projects in the area (USAF 2001).

PLANT SPECIES

SCIENTIFIC NAME	COMMON NAME	WIS[1]	COMMENTS
Acer negundo	Box elder	FACW	
Ambrosia psilostachya	Western ragweed	FAC	
Artemisia californica	California sagebrush		
Artemisia douglasiana	Mugwort	FACW	
Arundo donax[2]	Giant reed	FACW	
Baccharis pilularis	Coyote brush		
Baccharis douglasii	Marsh baccharis	OBL	
Baccharis salicifolia	Mulefat	FACW	
Conyza sp.	Horse weed	FAC	Likely *C. Canadensis*
Cotula coronopifolia[2]	Brass buttons	FACW+	
Cyperus eragrostis	Umbrella sedge	FACW	
Eleocharis sp.	Spikerush	OBL	Most *Eleocharis* spp. that occur in this area are FACW or OBL
Epilobium sp.	Willow herb	FACW	Most *Epilobium* spp. in this area are FACW or OBL
Gnaphalium luteo-album[2]	Weedy cudweed	FACW-	
Helenium puberulum	Sneezeweed	FACW	
Heterotheca grandiflora	Telegraph weed		
Hirschfeldia incana[2]	Mediterranean mustard	UPL	
Juncus xiphioides	Iris-leaved rush	OBL	
Juncus sp.	Rush	OBL/FACW	
Ludwigia peploides	Waterweed	OBL	
Melilotus alba[2]	White sweet clover	FACU+	
Mimulus guttatus	Monkeyflower	OBL	
Nicotiana glauca[2]	Tree tobacco	FAC	
Poligonum lapathifolium	Water smartweed	OBL	
Polypogon monspeliensis[2]	Rabbitsfoot grass	FACW+	
Rorippa nasturtium-aquaticum	Watercress	OBL	(= *Nasturtium officinale)*
Rubus ursinus	California blackberry	FAC+	
Rumex crispus[2]	Curly dock	FACW-	
Salix exigua	Sand bar willow	OBL	
Salix laevigata	Red willow	FACW+	
Salix lasiolepis	Arroyo willow	FACW	
Salix lucida ssp. *lasiandra*	Shining willow	OBL	(= *S. lasiandra*)
Scirpus maritimus	Alkali bulrush	OBL	
Scrophularia californica	Bee plant	FAC	
Solanum sp.	Nightshade	FAC/FACU	
Toxicodendron diversilobum	Poison oak		
Typha sp.	Nightshade	FAC/FACU	
Urtica dioica	Stinging nettle	FACW	
Xanthium strumarium	Cockle-bur	FAC+	

[1] Wetland Indicator Status (WIS) –
OBL (Obligate Wetland) = Occur almost always (estimated probability >99%) under natural conditions in wetlands.
FACW (Facultative Wetland) = Usually occur in wetlands (estimated probability 67-99%), but occasionally found in non-wetlands.
FAC (Facultative) = Equally likely to occur in wetlands or non-wetlands (estimated probability 34-66%).
FACU (Facultative Upland) = Usually occur in non-wetlands (estimated probability 67-99%), but occasionally found in wetlands (estimated probability 1-33%).
* = Following a regional indicator, identifies tentative assignments based on limited information from which to determine the indicator status.
+ or - = Used with the Facultative Indicator categories to more specifically define the regional frequency of occurrence in wetlands. A (+) indicates plants more frequently found in wetlands and a (-) indicates plants less frequently found in wetlands.

[2] Indicates non-native species.

WILDLIFE SPECIES

SPECIES	OCCURRENCE	SOURCE	STATUS[1]	COMMENTS
AMPHIBIANS				
Western toad *Bufo boreas*				
California red-legged frog *Rana aurora draytonii*	Observed	Christopher 1996, SRS 2003b	FT/CSC	
Bullfrog *Rana catesbeiana*	Observed	Christopher 1996, SRS 2003b		
Pacific treefrog *Pseudacris regilla*	Observed	SRS 2003b		
Ensatina *Ensatina eschscholtzii*	Expected			
REPTILES				
Southern Pacific pond turtle *Clemmys marmorata pallida*	Observed	Christopher 1996	FSC/CSC	
Southern alligator lizard *Elgaria multicarinata*	Expected			
Western fence lizard *Sceloporus occidentalis*	Observed	Christopher 1996, SRS 2003b		
Side-blotched lizard *Uta stansburiana*	Expected			
Western skink *Eumeces skiltoninaus*	Expected			
Two-striped garter snake *Thamnophis hammondii*	Expected			
California kingsnake *Lampropeltis getula californiae*	Observed	SRS 2003b		
Common garter snake *Thamnophis sirtalis*	Observed	Christopher 1996, SRS 2003b		
FISHES				
Southern steelhead *Oncorhynchus mykiss*	Observed	Swift 2000	FE/CSC	
Tidewater goby *Eucyclogobius newberryi*	Observed	Swift 2000, 2002; SRS 2003b	FE/CSC	
Arroyo chub *Gila orcutti*	Observed	Swift 2002; SRS 2003b	CSC	
Mosquito fish *Gambusia affinis*	Observed	Swift 2002, Swift et al 1997, SRS 2003b		
Starry flounder *Platichthys stellatus*	Observed	Swift et al 1997		
Staghorn sculpin *Leptocottus armatus*	Observed	Swift et al 1997		
Fathead minnow *Pimephales promelas*	Observed	Swift 2002, Swift et al 1997; SRS 2003b		
Largemouth bass *Micropterus salmoides*	Observed	Swift et al 1997		
Green sunfish *Lepomis cyanellus*	Observed	Swift et al 1997		
Prickly sculpin *Cottus asper*	Observed	Swift 2002, Swift et al 1997, SRS 2003b		

WILDLIFE SPECIES

SPECIES	OCCURRENCE	SOURCE	STATUS[1]	COMMENTS
Threespine stickleback *Gasterosteus aculeatus*	Observed	Swift 2002, Swift et al 1997, SRS 2003b		
Channel catfish Ictalurus punctatus	Observed	Swift 2002, Swift et al 1997, SRS 2003b		
Bullhead catfish *Ameiurus nebulosus*	Observed	Swift 2002, SRS 2003b		
BIRDS				
American bittern *Botarus lentiginosus*	Observed	Holmgren & Collins 1999	FSC	
Pied-billed grebe *Podilymbus podiceps*	Observed	Holmgren & Collins 1999, SRS 2003b		Nesting
Great blue heron *Ardea herodias*	Observed	SRS 2003b		
Great egret *Ardea alba*	Observed	SRS 2003b		
Black-crowned night heron *Nycticorax nycticorax*	Observed	Holmgren & Collins 1999, SRS 2003b		Nesting
Turkey vulture *Cathartes aura*	Observed	SRS 2003b		
Canada goose *Branta Canadensis*	Observed	SRS 2003b		
Gadwall *Anas strepera*	Observed	Holmgren & Collins 1999		Nesting
Mallard *Anas platyrynchos*	Observed	Holmgren & Collins 1999, SRS 2003b		Nesting
Green-winged teal *Anas crecca*	Observed	SRS 2003b		
White-tailed kite *Elanus leucurus*	Observed	Holmgren & Collins 1999, SRS 2003b	FSC (nesting)	
Northern harrier *Circus cyaneus*	Observed	Holmgren & Collins 1999	CSC (nesting)	Nesting
Sharp-shinned hawk *Accipiter striatus*	Observed	Holmgren & Collins 1999	CSC (nesting)	
Cooper's hawk *Accipiter cooperii*	Observed	Holmgren & Collins 1999, SRS 2003b	CSC (nesting)	
Red-shouldered hawk *Buteo lineatus*	Observed	SRS 2003b		
Red-tailed hawk *Buteo jamaicensis*	Observed	SRS 2003b		
Ferruginous hawk *Buteo regalis*	Observed	SRS 2003b	FSC/CSC (wintering)	
Golden eagle *Aquila chrysaetos*	Observed	SRS 2003b		
American kestrel *Falco sparverius*	Observed	SRS 2003b		
Merlin *Falco columbarius*	Observed	Holmgren & Collins 1999	CSC (wintering)	
California quail *Callipepla californica*	Observed	SRS 2003b		

WILDLIFE SPECIES

SPECIES	OCCURRENCE	SOURCE	STATUS[1]	COMMENTS
American coot *Fulica Americana*	Observed	SRS 2003b		
Killdeer *Charadrius vociferous*	Observed	Holmgren & Collins 1999		Nesting
Western gull *Larus occidentalis*	Expected			
Mourning dove *Zenaida macroura*	Observed	SRS 2003b		
Barn owl *Tyto alba*	Observed	SRS 2003b		
Great horned owl *Bubo virginianus*	Observed	SRS 2003b		
Allen's hummingbird *Selasphorus sasin*	Observed	SRS 2003b	FSC (nesting)	
Anna's hummingbird *Calypte anna*	Observed	SRS 2003b		
Belted kingfisher *Ceryle alcyon*	Observed	SRS 2003b		
Nuttall's woodpecker *Picoides nuttallii*	Expected			
Northern flicker *Colaptes auratus*	Observed	SRS 2003b		
Southwestern willow flycatcher *Empidonax traillii extimus*	Observed	Holmgren & Collins 1999	FE/SE	Nesting
Pacific-slope flycatcher *Empidonax difficilis*	Expected		FSC (nesting)	
Black phoebe *Sayornis nigricans*	Observed	Holmgren & Collins 1999, SRS 2003b		Nesting
Say's phoebe *Sayornis saya*	Observed	SRS 2003b		
Loggerhead shrike *Lanius ludovicianus*	Observed	Holmgren & Collins 1999	FSC/CSC (nesting)	
Least Bell's vireo *Vireo belli pusillus*	Observed	Holmgren & Collins 1999	FE/SE	
Hutton's vireo *Vireo huttoni*	Expected			
Warbling vireo *Vireo gilvus*	Expected			
American crow *Corvus brachyrhynchos*	Observed	SRS 2003b		
Horned lark *Eremophila alpestris*	Observed	Holmgren & Collins 1999	CSC	Nesting
Tree swallow *Tachycineta bicolor*	Observed	Holmgren & Collins 1999		Nesting
Northern rough-winged swallow *Stelgidopteryx serripennis*	Observed	Holmgren & Collins 1999		Nesting
Cliff swallow *Petrochelidon pyrrhonota*	Observed	Holmgren & Collins 1999		Nesting
Barn swallow *Hirundo rustica*	Expected			

WILDLIFE SPECIES

SPECIES	OCCURRENCE	SOURCE	STATUS[1]	COMMENTS
Chestnut-backed chickadee *Poecile rufescens*	Observed	Holmgren & Collins 1999, SRS 2003b		Nesting
Oak titmouse *Baeolophus inornatus*	Observed	SRS 2003b		
Bushtit *Psaltriparus minimus*	Observed	Holmgren & Collins 1999, SRS 2003b		Nesting
Bewick's wren *Thryomanes bewickii*	Observed	Holmgren & Collins 1999, SRS 2003b		Nesting
House wren *Troglodytes aedon*	Observed	SRS 2003b		
Marsh wren *Cistothorus palustris*	Observed	SRS 2003b		
Ruby-crowned kinglet *Regulus calendula*	Observed	SRS 2003b		
Swainson's thrush *Catharus ustulatus*	Expected			
Wrentit *Chamaea fasciata*	Observed	SRS 2003b		
European starling *Sturnus vulgaris*	Observed	SRS 2003b		
Orange-crowned warbler *Vermivora celata*	Expected			
Yellow warbler Dendroica petechia	Expected		CSC (nesting)	
Townsend's warbler *Dendroica townsendi*	Observed	SRS 2003b		
Common yellowthroat *Geothlypis trichas*	Observed	Holmgren & Collins 1999, SRS 2003b		Nesting
Wilson's warbler *Wilsonia pusilla*	Observed	Holmgren & Collins 1999		Nesting
Yellow-breasted chat *Icteria virens*	Observed	Holmgren & Collins 1999	CSC (nesting)	
California thrasher *Toxostoma redivivum*	Observed	SRS 2003b	FSC	
Spotted towhee *Pipilo maculatus*	Observed	SRS 2003b		
California towhee *Pipilo crissalis*	Observed	SRS 2003b		
Song sparrow *Elospiza melodia*	Observed	Holmgren & Collins 1999, SRS 2003b		Nesting
White-crowned sparrow *Zonotrichia leucophrys*	Observed	Holmgren & Collins 1999, SRS 2003b		Nesting
Black-headed grosbeak *Pheucticus melanocephalus*	Observed	Holmgren & Collins 1999		Nesting
Red-winged blackbird *Agelaius phoeniceus*	Observed	Holmgren & Collins 1999, SRS 2003b		Nesting
Tricolored blackbird *Agelaius tricolor*	Observed	Holmgren & Collins 1999	FSC/CSC (nesting colony)	
Western meadowlark *Sturnella neglecta*	Observed	Holmgren & Collins 1999, SRS 2003b		Nesting

WILDLIFE SPECIES

SPECIES	OCCURRENCE	SOURCE	STATUS[1]	COMMENTS
Brewer's blackbird *Euphagus cyanocephalus*	Observed	SRS 2003b		
Brown-headed cowbird *Olothrus ater*	Observed	Holmgren & Collins 1999		Nesting
Bullock's oriole *Icterus bullockii*	Expected			
House finch *Carpodacus mexicanus*	Observed	Holmgren & Collins 1999, SRS 2003b		Nesting
Lesser goldfinch *Carduelis psaltria*	Observed	Holmgren & Collins 1999		Nesting
Lawrence's goldfinch *Carduelis lawrencei*	Expected		FSC (nesting)	
American goldfinch *Carduelis tristis*	Expected			
House sparrow *Passer domesticus*	Expected			
MAMMALS				
Trowbridge's shrew *Sorex trowbridgii*	Expected			
Pallid bat *Antrozous pallidus*	Expected	Pierson et al. 2002	CSC	Record
Big brown bat *Eptesicus fuscus*	Observed	Pierson et al. 2002		Maternity roost
Western red bat *Lasiurus blossevillii*	Observed	Pierson et al. 2002		Foraging
Hoary bat *Lasiurus cinereus*	Expected	Pierson et al. 2002		Record
Silver-haired bat *Lasionycteris noctivagans*	Expected	Pierson et al. 2002		Record
California myotis *Myotis californicus*	Observed	Pierson et al. 2002		Roost
Yuma myotis Myotis yumanensis	Observed	Pierson et al. 2002	FSC	Maternity roost
Mexican free-tailed bat *Tadarida brasiliensis*	Observed	Pierson et al. 2002		Maternity roost
Desert cottontail *Sylvilagus audubonii*	Observed	SRS 2003b		
Brush rabbit *Sylvilagus bachmani*	Observed	SRS 2003b		
Botta's pocket gopher *Thomomy bottae*	Expected			
American beaver *Castor Canadensis*	Observed	SRS 2003b		
Dusky-footed woodrat *Neotoma fuscipes*	Observed	SRS 2003b		
California mouse *Peromyscus californicus*	Observed	USACHPPM 1995		
Deer mouse *Peromyscus maniculatus*	Observed	USACHPPM 1995		

WILDLIFE SPECIES

SPECIES	OCCURRENCE	SOURCE	STATUS[1]	COMMENTS
Western harvest mouse *Reithrodontomys megalotis*	Observed	USACHPPM 1995		
California vole *Microtus californicus*	Expected			
Coyote *Canis latrans*	Observed	SRS 2003b		
Raccoon *Procyon lotor*	Observed	SRS 2003b		
Long-tailed weasel *Mustela frenata*	Observed	SRS 2003b		
Striped skunk *Mephitis mephitis*	Expected			
Mountain lion *Felis concolor*	Expected			
Bobcat *Felis rufus*	Observed	SRS 2003b		
Feral cat *Felis sylvestris*	Observed	SRS 2003b		
Black-tailed (mule) deer *Odocoileus hemionus*	Observed	SRS 2003b		

[1] FE=Federal Endangered Species; FT=Federal Threatened Species; FSC=Federal Species of Concern. SE=State Endangered Species; ST=State Threatened Species; CSC=California Species of Concern.

Final
Environmental Assessment

13th Street Bridge
Emergency Repair and Retrofit

Vandenberg Air Force Base
California

Appendix D
Habitat Restoration Plan

DRAFT

HABITAT RESTORATION PLAN

13TH STREET BRIDGE PROJECT

VANDENBERG AIR FORCE BASE,

CALIFORNIA

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February 24, 2003

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1.0 INTRODUCTION

This Habitat Restoration Plan has been prepared as part of the environmental impact analysis process for the 13th Street Bridge project on north Vandenberg Air Force Base (AFB), California. The project involves bridge repair, reinforcement and retrofit of the 13th Street Bridge over the Santa Ynez River. 13th Street is the only on-base transport route and vehicle link between north and south Vandenberg AFB for mission related activities, and supports mission essential communication and utility lines. Inspections of the 13th Street Bridge since April 2001 have revealed the vulnerability of the bridge due to scouring and instability of the foundation. Both of these conditions have rendered the bridge inadequate to support normal vehicle loads. The proposed project will ensure transportation and communications between north and south Vandenberg AFB remain uninterrupted.

In compliance with the National Environmental Policy Act (NEPA), an environmental assessment (EA) and mitigation plan are presently being prepared for this project. The EA identifies potentially significant adverse impacts related to sensitive biological resources. The mitigation plan for the EA outlines mitigation measures that will be implemented for this project, one of which is the preparation of a habitat restoration plan. The purpose of this plan is to specify procedures necessary for the successful restoration of the native plant communities and wetland habitats that would be impacted in the project area.

1.1 PROJECT SETTING

Vandenberg AFB is located along the west coast of Santa Barbara County, in a transitional ecological region that includes the northern and southern distributional limits for many plant and animal species. Consequently, and because much of the base has been set aside as open space for security and safety reasons related to the mission, Vandenberg AFB supports a high diversity of biological resources, including many federal and state special status species.

The proposed project is located within the Lompoc Valley geomorphic region. The Santa Ynez River floodplain comprises the Lompoc Valley. This area lies within the Santa Maria Basin-San Luis Range (SMBSLR) domain of central California, a geologic transition zone between the Transverse Ranges Geomorphic Province to the south and the Coast Ranges Geomorphic Province to the north. The Santa Ynez River is the largest drainage basin of any stream on Vandenberg (Coulombe and Mahrdt 1976). This river originates in the San Rafael Mountains and flows through the communities of Solvang, Buellton and Lompoc before reaching its lagoon at Ocean Beach County Park. The Santa Ynez River flows along 70 miles (113 kilometers) and it has a drainage basin of 900 square miles (2,330 square kilometers). This river had perennial flow prior to the completion of Bradbury Dam in 1953. At the present, this is an intermittent river with highly fluctuating flow. Summer flow in the Santa Ynez River often drops to zero. Approximately 4 miles (6.4 kilometers) of the river runs through Vandenberg. This segment generally has some water flowing as a result of discharge of irrigation water from agricultural fields and swage from the Federal Correctional Institution in Lompoc, located just east of Vandenberg's boundary (Coulombe and Mahrdt 1976).

The project area is located at the point where 13th Street on Vandenberg AFB crosses the lower reach of the Santa Ynez River, approximately three miles east of the Pacific Ocean (Figure 1). The width of the riverbed at its passage through the project area varies between approximately 500 and 700 feet (Figure 2).

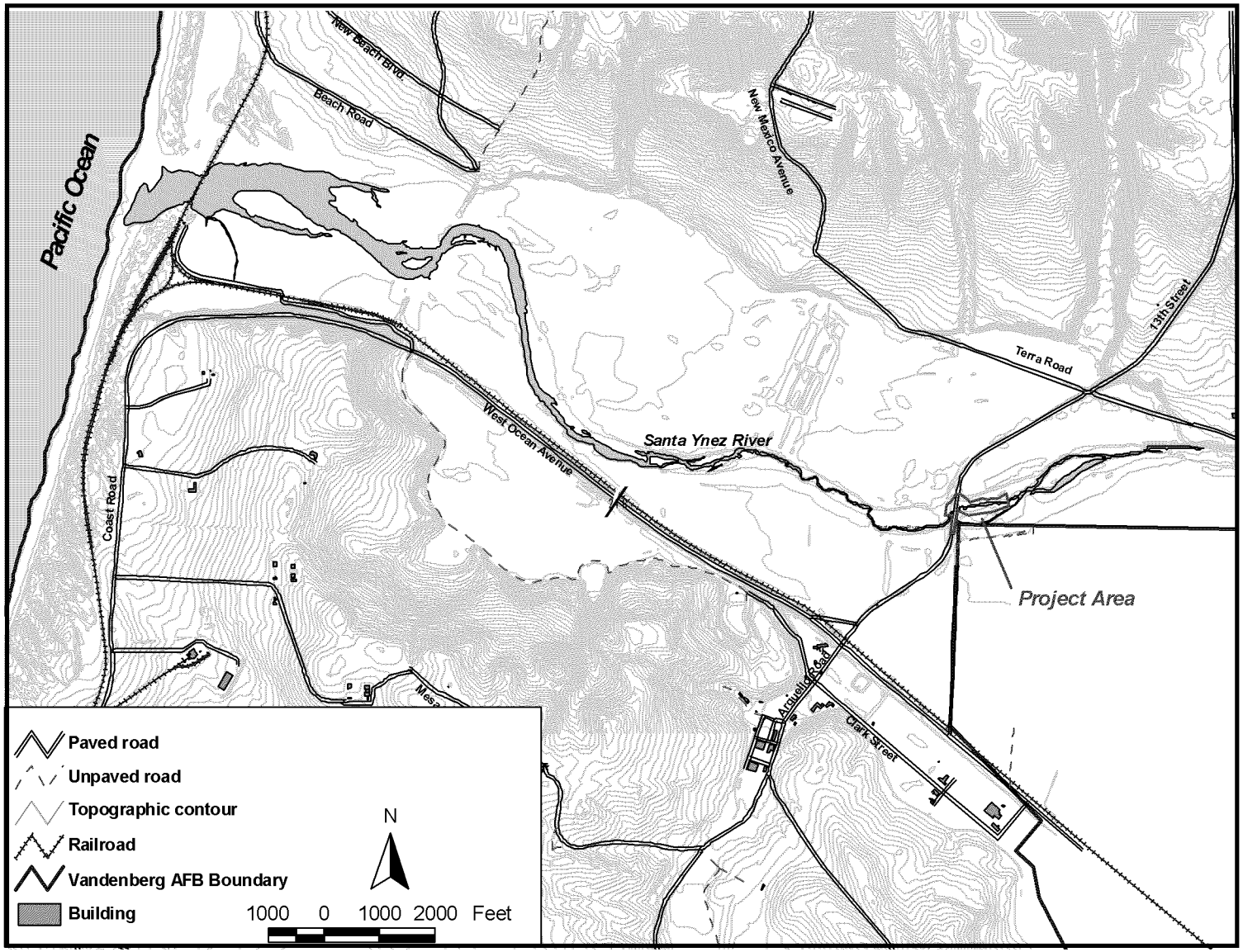

Figure 1. Location of the 13th Street Bridge project area.

Figure 2. Aerial view of the vicinity of the 13th Street Bridge project area.

The associated riparian and wetland habitats of the Santa Ynez River are closely related to the adjacent transitional and upland habitats along the drainage. A coastal marsh habitat occurs near the mouth of the river, where it drains into the Pacific Ocean.

The Lompoc valley is a broad synclinal valley occupied in part by the floodplain of the Santa Ynez River. The river area, is characterized by a Sorrento-Mocho-Camarillo soil association. This soil type is found in nearly level to moderately sloping terrain such as floodplains and alluvial fans. The soil is well drained to somewhat poorly drained, and it ranges from sandy loams to silty clay loams (Shipman 1981). This soil type is composed of 40 percent Sorrento soils, 30 percent Mocho soils, 10 percent Camarillo soils, and 20 percent other soil series. The Sorrento series consists of well-drained sandy loams to clay loams, which are recent fluvial or alluvial deposits and have a high to very high fertility. The erosion hazard is none to slight for Sorrento sandy loams and slight to moderate for Sorrento loams. The Sorrento series has a low to moderate shrink-swell potential. The Mocho series consists of well-drained alluvial and silty loams with a moderate to high fertility. It has a low to moderate shrink-swell potential and its erosion factor is none to slight. The Camarillo series consists of poorly drained, very fine-grained sandy loams to silty clay loams, which are alluvial in origin and have eroded from sandstone and shale bedrock. The fertility for the Camarillo series is moderate to high, there is no erosion hazard, and it has a low to moderate shrink-swell potential (Shipman 1972).

2.0 DESCRIPTION OF THE 13TH STREET BRIDGE PROJECT AND IMPACTS

The proposed project is a bridge repair. It consists of reinforcement and retrofit countermeasures that incorporate four separate components. The project consists of a short-term emergency repair (completed in December 2002-January 2003), and a proposed retrofit of the bridge (to begin in the summer of 2003). The countermeasures will control, inhibit, change, delay or minimize stream instability problems. Retrofitting countermeasures are common and often essential to resolve stability issues not addressed at the time of older bridge design and construction. This is the case with the 13th Street Bridge. The 2002-2003 winter storms had the potential to raise the water level in the Santa Ynez River, which could result in additional erosion and scouring around the bridge piers and abutment. This could lead to collapse of the bridge.

2.1 EMERGENCY REPAIR

2.1.1 Project Description

The emergency repair entailed placing rock riprap around the three northerly piers, and under and on either side of the northerly abutment, approximately 70 feet upstream and 70 feet downstream from the centerline of the bridge, prior to the winter of 2002-2003, to temporarily protect the structure against winter flood events. These emergency repairs were completed in 28 days.

Protection of the three northerly piers was accomplished by placing approximately 800 tons of rock (351 cubic yards) around the piers (7, 8, and 9). A large backhoe or excavator operated from the riverbed to individually place the rocks. Keyways approximately 10 feet deep were excavated around the piers to allow for the placement of a layer of rock approximately 10 feet deep at the base of each of the piers.

Approximately 1465 cubic yards of soil were excavated and removed from around the piers to place the rock riprap. Excess material excavated in this operation was transported to a designated waste or fill site.

Stabilization of the northerly abutment entailed the installation of rock riprap in an area of the northerly bank approximately 70-feet upstream and 70-feet downstream of the abutment. An estimated 2,700 tons of rock (1,184 cubic yards) were placed along the bank adjacent to the northerly abutment. The rock was embedded approximately 10 feet below the existing toe of the bank, and formed a layer approximately 7 feet deep. Approximately 1,950 cubic yards of soil were excavated and removed from the embankment to place the rock riprap. Filter fabric was placed below the rock to prevent the rock from settling and becoming ineffective in protecting the bank. Excess material excavated in this operation was transported to a designated waste or fill site. Where possible, the rock was placed from the top of the bank, and the remainder from the riverbed. A large backhoe or excavator operated from the riverbank and from the riverbed below to individually place the rocks, to ensure a stable surface that would provide stability and protection to the riverbank.

2.1.2 Construction Requirements

Access to the construction area at the northerly abutment and to the piers 7 through 9 in the riverbed was needed adjacent to the abutment. An existing access road on the downstream side of the northerly abutment, which provides access to this abutment, was cleared of growing vegetation (mostly disturbed Central Coastal Scrub dominated by coyote brush [*Baccharis pilularis*]), and temporarily reestablished for access to the abutment and piers and placement of the rock riprap. Soil from the Terra Road borrow site was used to provide a firm surface that would appropriately support travel by construction equipment on very soft soil. The soil at the embankment was compacted, geotextile fabric laid out, and borrow site shale/soil placed on top to provide a hard stable surface for the equipment. This road extended approximately 60 feet upstream and 60 feet downstream from the northerly abutment, and had a 20-foot wide base. Approximately 2,000 cubic yards of soil and 340 cubic yards of shale were used for this access. Because this temporary access would be used during the proposed retrofit, and it would not interfere with channel flow, it was maintained and covered by the rock riprap placed along the embankment. The road will be removed as the rock riprap is placed on the abutment and the embankment during the proposed retrofit.

Because river flow increased significantly with the late fall rainstorms, temporary containment of the river was necessary for equipment to access the riverbed and to prevent the river from continually feeding live surface water directly onto the base of the northerly abutment and piers. Temporary containment was accomplished by installing a K-rail barrier (2 feet at the base and 2.7 feet high) 60 feet upstream of the bridge from the northern embankment toward the center of the riverbed to approximately halfway between piers 7 and 6 (210 feet) and then turning downstream between these two piers past the bridge structure (120 feet). The barrier was slightly directed downstream so river flow would be directed more gently. Filter fabric was placed underneath the K-rails and 10-30 ml high-density polyethylene (HDPE) liner over the K-rails towards the river flow. The HDPE liner was held in place with precast concrete blocks approximately 12 inches in diameter and weighing 370 pounds each. The back side of the K-rails was supported with sand from the riverbed. This K-rail was maintained in place throughout the construction period until all equipment operation from the riverbed was completed (approximately 21 days).

A construction staging area (for parking and maintenance of equipment and storage of construction materials) was created outside of the riverbed east and west of 13th Street near the northern approach to the bridge. The existing flat area at the northeast corner of the bridge was considered. However, this area

is too small to accommodate all of the construction activity. An additional section, approximately 1.0 acre, was created adjacent to the temporary access road at the northwest approach to the bridge.

Equipment was fueled or serviced a minimum of 500 feet outside of the riverbed, near the northern approach to the bridge. Any vehicles requiring servicing were worked on in this designated area outside the riparian corridor prior to entering the riverbed.

2.2 PROPOSED RETROFIT OF BRIDGE

2.2.1 Project Description

The proposed retrofit would consist of the installation of retrofit components to protect the bridge substructure and superstructure, and the protection and stabilization of the northerly abutment and riverbank. This proposed retrofit would begin in the summer of 2003. It is estimated that this retrofit would take approximately 150 days.

Work would be limited to daylight hours only. While some of the work would occur from on top of the bridge deck, access to the riverbed would also be needed. Construction activities would be confined to the area in the riverbed 60 feet upstream and 30 feet downstream from the bridge, and along the northern half of the riverbed, approximately 900 feet upstream and 150 feet downstream of the northerly abutment, and extending up to 450 feet towards the center of the riverbed. Equipment present in the riverbed would be performing construction or transporting materials to and from the various construction sites. An area near the bridge along the banks, outside the river, would be used for staging and storage purposes. Access across the bridge during the retrofit construction on the bridge substructure and superstructure would be limited to construction traffic only.

A large backhoe or excavator would operate from the riverbed and the riverbank to remove the rock riprap placed during the emergency repair at the northerly abutment to expose the temporary access road and provide access to the riverbed and the work area. Similarly, the rock riprap placed to temporarily protect the three northerly piers (7, 8 and 9) would be removed to allow access to the base of the piers.

The foundations of the bridge piers and the northerly abutment would be retrofitted to increase their strength and performance capacity. The retrofit would consist of reinforcing each pier wall with five micropiles, and each abutment with seven micropiles (a six to eight inch diameter steel pipe drilled and grouted into place). The existing pier wall connection to the pile cap will be strengthened through the addition of link beams between the piles, and a continuous concrete beam on top of the existing pile cap. In addition, rock riprap will be placed at the base of each pier wall and at the abutments. This retrofit work would help to distribute the vertical load to the soil and provide additional lateral resistance to the structure.

Soil-pile interaction would be improved with the use of pressure grouting and soil mixing around the piers and northerly abutment. Soil grouting would begin at approximately 10 to 12 feet below the flow line and extend downward to a level near the tip of the existing piles. This soil grouting and soil mixing would also improve the load bearing characteristics of the soil. In this operation 450 cubic yards of sodium silicate and calcium chloride would be mixed with the soil at the base of the piers and the northerly abutment. Once the foundations are improved, the pier walls would be strengthened with additional concrete and bar reinforcing steel, and the pile cap to pier wall connection improved by installing a link beam.

Excavation would be required to expose the existing pile caps adequately for the retrofit operation. It is anticipated that the excavation would not exceed 6-8 feet below the existing grade and that the total amount of excavation for this component of the project would be approximately 450 cubic yards. Excess material from these excavation activities would be transported to a designated waste or fill site.

The bridge superstructure would be strengthened by the addition of concrete to widen the existing "T" beams near the supports, to increase the negative moment capacity of the superstructure. Polymer composite fiber added to the bottom of the "T" beam girders will provide additional positive moment capacity to the span. Falsework and scaffolding would be required under the existing bridge, extending approximately 15 feet beyond the downstream edge rails and 15-feet beyond the upstream training noses.

Stabilization of the northerly riverbank and bridge abutment would entail the installation of rock riprap in an area of the northerly riverbank approximately 200 feet upstream and 110 feet downstream of the abutment. Rock riprap will also be placed in front of the northerly abutment (about 50 feet). It is estimated that 4,500 tons of rock (2,300 cubic yards) would be placed along the bank adjacent to the northerly abutment. The rock would be embedded approximately 10 feet below the toe of the bank and form a layer approximately 7 feet deep. Approximately 450 cubic yards of soil would be excavated and removed from the embankment to place the additional rock riprap. Filter fabric would be placed below the rock to prevent it from settling and becoming ineffective in protecting the bank. Excess material excavated in this operation will be transported to a designated waste or fill site.

The rock would be placed individually to ensure a stable surface that would provide stability and protection to the riverbank. Where possible, the rock would be placed from the top of the bank, and the remainder from the riverbed. A large backhoe or excavator would operate from the riverbank and from the riverbed below to individually place the rocks, to ensure a stable surface that provides stability and protection to the riverbank. Wire baskets would be filled with rock and pulled into place underneath the bridge deck at the northerly abutment to provide protection to the abutment at this location.

Stabilization of the northerly riverbank upstream of the rock riprap would entail the installation of a 750-foot long pile retard system. This system consists of a succession of steel piles (12 in x 53 in) placed in single rows (bents) radiating out from the eroded bank, somewhat perpendicular to the flow of the river. The system proposed for stabilization of the northerly riverbank upstream of the 13th Street Bridge would consist of approximately 10 bents of 50-foot long driven piles (about 183 piles) from the bank running toward the channel center line to meet the flow of the river. Approximately one mile of cabling will run continuously from pile to pile as it protrudes into the stream. As water flows between the cabling, debris is collected and the velocity of the water is reduced. Sediment drops out of the water as a result of the loss of velocity, leaving sediment at the base of the piles. Over time, the sediment builds up and the flow of the river would move southerly, away from the piles, providing long-term protection at the northerly bridge abutment and the existing bank. The area between each bent adjacent to the riverbank would be revegetated to aid in decreasing water velocity.

Construction equipment for placement of the pile retard system would consist of a crane with a pile-driving hammer, and delivery trucks. This equipment would operate from the riverbed to drive the piles in place.

2.2.2 Construction Requirements

Access to the riverbed and the construction area at the piers would be created adjacent to and upstream of the bridge at the northerly abutment. A temporary access road would be built across the riverbed to provide access to the base of the piers. Because the retrofit operations would require access to all the

piers, this road would span across the riverbed from pier 9 to pier 2. Soil from the Terra Road borrow site would be used to raise the roadway approximately 6 feet above the riverbed. The riverbed soil would be compacted, geotextile fabric laid out, borrow site soil put in place, and shale placed over this additional soil to provide a hard stable surface for the equipment. This road would be approximately 475 feet long, with a 32-foot wide base. Ten-foot extensions would be placed between each pier to allow equipment access to the piers. Approximately 3,875 cubic yards of soil and 650 cubic yards of shale would be used. Prior to compacting the riverbed soil, large vegetation (greater than 2.5 inch diameter) would be cleared using hand-held chain saws. Root systems would be left intact. Smaller vegetation present in the path of the road would be crushed during road installation. The shale, borrow site soil, and geotextile fabric used for the construction of this road would be removed upon completion of the project.

Temporary access to the riverbed approximately 900 feet upstream of the bridge, would be needed for construction activities associated with the installation of the pile retard system. This access would have varying widths between 100 feet and 200 feet from the northern riverbank towards the center of the riverbed. The soil would be compacted, geotextile fabric laid out and shale placed over the fabric to provide a hard stable surface for the equipment. Approximately 5,000 cubic yards of shale would be used for this access. Prior to compacting the soil, large vegetation (greater than 2.5 inch diameter) would be cleared using hand-held chain saws. Root systems would be left intact. Smaller vegetation would be crushed during installation of this temporary access. This access would not interfere with flow of water because the area required for construction access would not reach the river channel. The shale, and geotextile fabric used for the construction of this road would be removed upon completion of the project.

Temporary containment of the river would be necessary to prevent equipment from sinking into the riverbed and to prevent the river from continually feeding live surface water directly onto the excavation sites. Containment would be accomplished by impounding the channels at a location upstream of the construction limit and installing two 48-inch HDPE pipes or CMP that would allow the active river channel to pass underneath the surface of the temporary access road between pier 9 and the abutment. Each pipe would be 1,200 feet long. It is expected that the culverts would be in place throughout the construction period for the proposed retrofit (five months).

Subsurface flow will be controlled with the use of pumps and cofferdams during individual excavations. To prevent sediments from being dispersed into the river, filters will be used at these sites.

In addition to the staging areas described under the emergency repair, additional short-term storage space for temporary staging of materials within the riverbed would be needed during the proposed retrofit. The areas most suitable for this are situated within the existing unvegetated sandbar upstream of the bridge. Construction materials that will be stockpiled in these areas will include shoring and falsework form lumber, erosion control devices, stone aggregates, and tools needed to build and erect the scaffolding to retrofit the bridge and provide bank protection.

Equipment would be fueled or serviced a minimum of 500 feet outside of the riverbed, near the northern approach to the bridge. Prior to entering the riverbed, any vehicles requiring servicing will be worked on in the designated area outside the river and riparian corridor.

However, large cranes may require disassembly to reach the work site and may require crane mats to sit on or move to keep from sinking. Removing this equipment for fueling may not be feasible because of the effort to set up the equipment to work safely. Should refueling operations be necessary for large cranes operating within the riverbed, these operations will incorporate safety measures such as temporary catch pans or basins to place under the fill areas to catch accidental overflow. A spill prevention/containment plan will be prepared by the construction contractor.

3.0 DESCRIPTION OF BIOLOGICAL RESOURCES IN THE PROJECT AREA

3.1 PLANT COMMUNITIES AND SPECIAL-STATUS SPECIES AFFECTED BY THE PROJECT

Sensitive plant communities recorded in the California Natural Diversity Data Base for the Surf 7.5 minute U.S. Geological Survey (USGS)) quadrangle, and which occur within the proposed project area include the wetlands communities Southern Willow Scrub and Coastal Freshwater Marsh. Other plant communities within the project area include Central Coast Scrub, Ruderal, and agricultural lands. All five of these communities would be affected by project related activities.

Large areas of the river channel have extensive sandbars that appear to have formed recently (i.e., within the last three to six years). The vegetative cover on these sandbars is low to moderate and includes many native and non-native, weedy, annual species commonly found in upland or wetland transitional habitats. Plant species on these sandbards include white sweet clover (*Melilotus alba*), telegraph weed (*Heterotheca grandiflora*), horseweed (*Conyza* spp.), cocklebur (*Xanthium strumarium*), and western ragweed (*Ambrosia psilostachya*). In addition to these annual species, patches of willows are also present within these recently deposited sand bards. Many willows appear to be resprouts from fallen trees or branches that have been washed downstream and buried (in some cases, the trunk of the parent tree is exposed) resulting in small stems originating from a central point in the soil. Others had evidently established from seed after flood events in recent years.

All of the willows on the sandbars and the lower portions of the northern bank of the river, within the construction zone, appear to be young trees. None of the stems has a diameter at breast height (dbh) greater than four inches, and most of the stems are less than one inch dbh. In addition, the canopy of the willow scrub has not yet developed enough to intertwine making it difficult to penetrate. The southern bank of the river, however, supports a well developed willow woodland on a high sand bar terrace within the river channel. This terrace is approximately five feet above the current active channel and, extended to the outer, southern bank of the Santa Ynez River. The willows on this terrace are large, with distinct main trunks and an interlocking canopy.

The native plant communities targeted for restoration are described in more detail below. Plant species nomenclature in this plan follows Hickman (1993).

3.1.1 Southern Willow Scrub

This is the dominant community found in the Santa Ynez River riparian corridor in the vicinity of the 13th Street Bridge. It is composed of a variety of willow species including arroyo willow (*Salix lasiolepis*), red willow (*Salix laevigata*), and shining willow (*Salix lucida* ssp. *lasiandra*) of varying age classes. Sand bar willow (*Salix exigua*) is also present at scattered locations on the sand bars within the river channel, and in dryer areas of the site. Herbaceous species in the understory include stinging nettle (*Urtica dioica*), California blackberry (*Rubus ursinus*), nightshade (*Solanum* sp.), California figwort (*Scrophularia californica*), and mugwort (*Artemisia douglasiana*). Coyote brush (*Baccharis pilularis*), box elder (*Acer negundo*), and poison oak (*Toxicodendron diversilobum*) are present on the upper banks

and are interspersed among the willows or are found in open areas where the willow canopy is lacking. Large patches of non-native tree tobacco (*Nicotiana glauca*) are present on the upper north bank of the river and in open, drier areas within the river channel.

3.1.2 Freshwater Marsh

The dominant plant species in the wetter areas with inundated or saturated soils include water cress (*Rorippa nasturtium-aquaticum*) and cattails (*Typha* spp.); these are generally found in monotypic stands. Other species present include brass buttons (*Cotula coronopifolia*), willow herb (*Epilobium* sp.), sticky baccharis (*Baccharis douglasii*), weedy cudweed (*Gnaphalium luteo-album*), and sneezeweed (*Helenium puberulum*). Within or adjacent to flowing water, less abundant species included iris leaved rush (*Juncus xiphioides*), umbrella sedge (*Cyperus eragrostis*), water weed (*Ludwigia peploides*), common monkey flower (*Mimulus guttatus*), water smartweed (*Polygonum lapathifolium*), and spikerush (*Eleocharis* sp.). One patch of giant reed (*Arundo donax*), an exotic species known to aggressively invade riparian habitats, is present adjacent to bridge pier 8.

3.1.3 Central Coast Scrub

Central Coast scrub is an upland plant community found distributed outside the Santa Ynez River floodplain in the 13th Street Bridge project area. It is often referred to as soft chaparral, but unlike chaparral, it contains species that are mesophyllous and shallow-rooted, and often are drought-deciduous and summer-dormant. Plant growth is concentrated in winter and spring, when soil moisture is readily available. Coastal sage scrub is a diverse vegetation type dominated by the shrub California sagebrush (*Artemisia californica*). In disturbed or more mesic areas, the dominant species may be coyote brush. Within the project area, and as a result of previous disturbances, coyote brush is overwhelmingly dominant. Other species found in this community within the project include poison oak, and black sage (*Salvia mellifera*).

3.1.4 Special-Status Plant and Wildlife Species

Several special-status species are found or have the potential to occur in the immediate project impact zone where restoration would occur. Federal endangered and threatened species include Southern steelhead (*Oncorhynchus mykiss irideus*, federal endangered species), Tidewater goby (*Eucyclogobius newberryi*, federal endangered species), Southwestern willow flycatcher (*Empidonax traillii extimus*, federal endangered species), and California red-legged frog (*Rana aurora draytonii*, federal threatened species). The project area is within the historical range of La Graciosa thistle (*Cirsium loncholepis*, federal endangered species) (CDFG 2001). However, this species was not observed during the vegetation surveys conducted concurrently with the wetland delineation (SAIC 2002).

In addition, the following federal species of concern have the potential to be adversely affected by the proposed project: Southern Pacific pond turtle (*Clemmys marmorata pallida*), American bittern (*Botarus lentiginosus*), Ferruginous hawk (*Buteo regalis*) [wintering], Allen's hummingbird (*Selasphorus sasin*) [nesting], Pacific-slope flycatcher (*Empidonax difficilis*) [nesting], Loggerhead shrike (*Lanius ludovicianus*) [nesting], California thrasher (*Toxostoma redivivum*), Lawrence's goldfinch (*Carduelis lawrencei*) [nesting], and Yuma myotis (*Myotis yumanensis*).

The restoration of native plant communities at the 13th Street Bridge project site will restore affected habitat and will preserve or enhance existing habitat for these special-status species, both in the Santa Ynez River and in adjacent wetland and upland areas.

3.2 STATUS OF THE SPECIES

La Graciosa Thistle (*Cirsium loncholepis*) [Federal Endangered Species]. This species is endemic to areas on the margins of coastal wetlands in Southern San Luis Obispo county and northern Santa Barbara County. The proposed project area at the Santa Ynez River is within the historical range of this species. The last confirmed observation along the Santa Ynez River occurred in 1958 (Smith 1983).

The U.S. Fish and Wildlife Service published the proposed designation of critical habitat for La Graciosa thistle on November 15, 2001. Given that no plants have been located since 1958 within the historical range of this species along the Santa Ynez River on Vandenberg AFB, this area was not included in the critical habitat proposal.

Southern steelhead (*Oncorhynchus mykiss irideus*) [Federal Endangered Species]. The Santa Ynez River was historically a major spawning ground and nursery for steelhead and supported the largest steelhead run in Southern California (Romero 1993). The section of the river that occurs within the boundaries of Vandenberg AFB, including the project area, is presently used by steelhead for migration to and from spawning sites further upstream. Steelhead migrate upstream December through April. Downstream migration by smolts can occur any time of year.

Tidewater goby (*Eucyclogobius newberryi*) [Federal Endangered Species]. The tidewater goby has been reported in all the major creeks on Vandenberg AFB—San Antonio, Canada Honda, and Shuman—as well as in the Santa Ynez river, and in both the Santa Ynez and San Antonio lagoons. This species has been recorded up to 7.5 miles upstream from the ocean in the Santa Ynez River (Swift et al 1997). The tidewater goby population in the Santa Ynez River is the largest on Vandenberg AFB but can fluctuate dramatically between years (Swift et al 1997). The tidewater goby is known to breed in the lagoon approximately 0.9 miles downstream from the project area. No breeding by tidewater gobies has been documented upstream of the Santa Ynez River lagoon (Swift et al 1997). Breeding occurs late April to early May followed by dispersal and migration to upstream locations.

Critical habitat for the tidewater goby was designated on November 20, 2000. Streams and drainages within Vandenberg AFB were not included in this designation.

California red-legged frog (*Rana aurora draytonii*) [Federal Threatened Species]. California red-legged frogs occur in nearly all permanent streams and ponds on Vandenberg AFB (Christopher 1996). Red-legged frogs are known to occur in the Santa Ynez River downstream of the 13th Street Bridge (Hunt 1990). A single California red-legged frog was found approximately 100 meters downstream of the bridge near the north bank in late October 2002 (S. Christopher personal communication to N. Francine, Vandenberg AFB). The Santa Ynez River within the project area does not provide suitable habitat for breeding, which occurs from February to mid-April.

Critical habitat for the California red-legged frog was designated on March 13, 2001. However, Vandenberg AFB was excluded from final designation of critical habitat for the California red-legged frog because the base's Integrated Natural Resources Management Plan contains habitat protection measures for this species.

Southwestern willow flycatcher (*Empidonax traillii extimus*) [Federal Endangered Species]. This spring and summer resident of willow thickets in riparian habitats, is most numerous where extensive thickets of low, dense willows edge on wet meadows, ponds, or backwaters. The willow flycatcher arrives to breeding grounds in early May and departs in August after breeding has been completed. Willow flycatchers are known to occur in the Santa Ynez riparian corridor and have nested approximately 300 feet west of the 13th Street Bridge (Holmgren and Collins 1999).

Critical habitat for the Southwestern willow flycatcher was designated on July 22, 1997 (62 FR39129). The Santa Ynez River drainage and Vandenberg AFB was excluded from this designation.

3.3 PROJECT IMPACTS ON NATIVE PLANT COMMUNITIES

Approximately 1.5 acres of Southern Willow Scrub, 1.3 acres of Freshwater Marsh, and 1.2 acres of Central Coast Scrub would be affected by project related activities.

3.4 EMERGENCY REPAIR

Placement of rock riprap along the northern bank of the river resulted in the permanent loss of approximately 0.2 acre of willow scrub habitat. Construction requirements for placement of the rock riprap around the bridge piers during the emergency repair also resulted in the removal of approximately 0.4 acre of freshwater marsh vegetation. Approximately 0.2 acre of this freshwater marsh vegetation is not expected to re-establish due to the placement of rock riprap around the piers and at the base of the northerly abutment. However, approximately 0.2 acre is expected to reestablish after full completion of the project (fall of 2003).

Approximately 1.2 acres of coastal scrub were removed during the emergency repair to create the construction staging areas and the temporary access roads at the northern approach of the 13th Street Bridge. Because the root systems were not removed, this vegetation is expected to re-emerge once all construction is completed at the end of the proposed retrofit.

One patch of giant reed, an exotic species known to aggressively invade riparian habitats, was present adjacent to bridge pier 8, and was removed during construction activities.

3.5 PROPOSED RETROFIT OF BRIDGE

Placement of rock riprap and the pile retard system on the northerly bank during this proposed retrofit of the project would result in the permanent loss of approximately 1.3 acres of willow scrub. Placement of additional rock riprap and the pile retard system during this retrofit would also result in the removal of approximately 0.9 acre of freshwater marsh vegetation. Approximately 0.1 acre of this freshwater marsh will be permanently loss due to the installation of the pile retard system. The remaining 0.8 acre is expected to reestablish after completion of the project.

Over the long term, the pile retard system should enhance habitat by reducing bank scour and facilitating establishment of wetland and riparian vegetation in the backwater areas created by it. Although a loss of an estimated 1.3 acres of willow scrub would result, it is expected that freshwater marsh (estimated at 0.8 acre) will become established around the piles of this system, resulting in a net gain of 0.5 acre of freshwater marsh. In addition, although difficult to estimate, an increase in willow scrub is expected to occur downstream of the pile retard system, as the erosion and scouring of the northern riverbank are diminished by the protection afforded with the pile retard system, providing the opportunity for riparian vegetation to become established in the long-term.

4.0 RESTORATION AND REVEGETATION PROCEDURES

4.1 RESTORATION GOALS AND OBJECTIVES

The primary goals of restoration are to reestablish the native wetland and upland plant communities that would be impacted adversely by the project, and for the revegetated areas to develop the characteristics of neighboring natural habitats. In the long term, the restored communities should be healthy, self-sustaining, regenerating, and result in effective soil stabilization and erosion and sedimentation control. In addition, the restoration areas should not pose a threat to adjacent plant communities by introducing a source of weeds or non-local genotypes of native plant species. The restoration of native plant communities also should provide habitat for special-status species that have been lost or adversely impacted in the project area.

Monitoring and maintenance of the restoration areas will track the progress of native vegetation development over time and ensure that revegetation objectives are achieved. The restoration area will be monitored for 5 years, and periodic erosion and weed control measures applied as necessary. If the restoration goals and objectives are met, project-related impacts will be mitigated, native habitats for plants and animals will be preserved, and the Santa Ynez River crossing will be protected from erosion and sedimentation hazards.

4.2 RESTORATION PLANNING

Since ecological restoration is a relatively new field and each restoration effort is unique in some way, restoration planning must, by necessity, be flexible enough to adapt to changing circumstances. The procedures described in this plan are those that have been used in various projects on the base and in the region; however, few restoration projects have been monitored carefully over a long enough period of time to provide a complete understanding of the restoration process. All restoration procedures, therefore, are still experimental to some extent. Moreover, post-construction conditions are not always predictable, and the most successful restoration treatments often are determined by analyzing the actual post-construction conditions.

Therefore, the 13th Street Bridge project area will be inspected following construction to determine if additional areas of disturbance require restoration, or to determine if any other procedures are necessary or applicable. Further restoration planning and finalizing restoration procedures will include calculating acreages of plant communities or habitats lost (the values in Section 3 above are current estimates based on the description and impacts of the Proposed Action as discussed in the EA), evaluating mitigation and habitat replacement ratios if necessary, preparing distribution maps of plant communities, finalizing revegetation prescriptions, and making revisions to this plan. All changes will be made in consultation with, and with the concurrence of, the Vandenberg AFB botanist (30 CES/CEVPN), and will be documented in the first monitoring report.

4.3 RESTORATION GUIDELINES AND PROCEDURES

4.3.1 Protection of Native Resources and Special-Status Species During Restoration

All relevant mitigation and monitoring measures specified for biological resources in the EA will be implemented during restoration activities in the project area to minimize further adverse impacts to native

biological and wetland resources, particularly special-status species. These mitigation measures include, but are not limited to, minimizing construction impacts, minimizing the removal of native vegetation, and protecting special-status species. All work crews at the site, including construction, herbicide spraying, erosion repair, or landscaping workers, will receive onsite training to identify non-native and native resources and species, particularly special-status species. A biological monitor familiar with the site, the project, and resources in the project area will be present to supervise all restoration activities.

4.3.2 Pre-Revegetation Procedures

Portions of the upland project area, particularly disturbed areas next to the roadway or along dirt trails, are covered with the invasive exotic species iceplant (*Carpobrotus edulis*) or veldt grass (*Ehrharta calycina*). These species can rapidly colonize areas and spread to replace native species, such as those to be revegetated. Therefore, before revegetation commences, initial exotics control will be implemented for the eradication of these invasive species. Both species will be sprayed with the herbicide Roundup at a concentration of 2 percent, with surfactant and dye included in the herbicide mix to mark sprayed areas. Care will be taken not to spray herbicide when wind velocities at the site exceed 5 miles per hour, and in foggy or rainy conditions when ground moisture becomes excessive. Non-target species, especially native species, will be avoided during spraying. It may be necessary to conduct more than one herbicide treatment cycle prior to revegetation. A biological monitor familiar with the site will be present to supervise herbicide spraying activities.

If erosion or sedimentation problems arise during or after construction, these areas will be repaired before revegetation proceeds. All erosion repair activities also will be monitored to prevent unnecessary impacts to native biological and wetland resources.

4.3.3 Revegetation

Any introduced fill material will be of local origin where possible, to avoid introducing foreign soil or plant source material into the restoration area. Seed and plant material from native species to be used in the revegetation areas will be derived from local sources, to preserve the integrity of local gene pools and ensure adaptability of the planted material to the local environment. To ensure genetic diversity, seeds and/or cuttings will be collected from a number of different plants and a variety of locations within a collection zone. In general, collected seeds and plant material will not be stored for a period longer than one year, due to loss of viability of the seed. Should the seed need to be stored for a longer period of time, viability tests for the component species will be performed. Seed will be stored under proper storage conditions, and each species maintained separately without mixing until seed mix prescriptions are finalized.

Two main seed mixes, a wetland and an upland mix, will be used in the 13th Street Bridge project restoration area. Table 4-1 provides a general list of wetland and upland species that occur most commonly in the project area; some of these species may be selected to form each seed mix.

The final list of species to be used and specifications for the two revegetation seed mixes will be prepared during the final restoration planning phase, after post-construction inspections have been carried out, as described in Section 4.2. A relatively large number of species will be included in the seed mixes to increase the chance for successful vegetation establishment in variable environmental conditions. The specific composition of the seed mixes will be finalized based on the species composition of plant communities present in different parts of the project area. The composition of the seed mixes also will be based upon the likely rate of establishment of the species, and the erosion control functions and wildlife

Table 4-1
List of Species That Occur Most Commonly in the Project Area

Wetland Species	Upland Species
Acer negundo *Ambrosia psilostachya* *Artemisia douglasiana* *Baccharis douglasii* *Baccharis salicifolia* *Cyperus eragrostis* *Eleocharis* sp. *Juncus xiphioides* *Ludwigia peploides* *Mimulus guttatus* *Polygonum lapathifolium* *Rorippa nasturtium-aquaticum* *Rubus ursinus* *Salix exigua* *Salix laevigata* *Salix lasiolepis* *Salix lucida* ssp.*lasiandra* *Scirpus maritimus* *Scrophularia califiornica* *Typha* sp.	*Artemisia californica* *Baccharis pilularis*

habitat values of that particular community. Species, their collection times, and their application rates may be adjusted as necessary depending on availability of seed during the collection season.

The different mixes will be applied in the appropriate matching natural plant community zones. Transitional habitats may receive a third seed mix composed of a combination of several wetland and upland species, if necessary. The areas to be revegetated will be measured, divided equally, and marked in the field to aid in even distribution of seed material. Seeds will be pre-mixed according to the prescribed specifications, bagged in lots, and hand-broadcast at the restoration sites. The seed then will be raked or chained into bare areas in the soil.

Seeding will be supplemented by planting larger woody plants, primarily arroyo willow wands, which can be placed directly into moist or wet soil. Additionally, other shrubs and herbaceous perennial herbs, such as California blackberry, rushes (*Juncus* spp.), or sedges (*Scirpus* spp.) may be planted as cuttings or plugs.

The need for irrigation in the upland revegetation areas will be determined based upon environmental conditions at the time of planting; if necessary, irrigation in accessible areas may be carried out using water trucks and hoses. If irrigation water is chlorinated, it must be contained to upland areas.

4.3.4 Post-Revegetation Procedures

Following revegetation, slopes within the restoration areas will be stabilized using jute netting or other appropriate material, such as straw or fiber blankets. These activities also will be monitored to prevent unnecessary impacts to native biological and wetland resources. Access to the restoration areas by foot and vehicular traffic will be prevented by installing a fence or barrier system at the boundaries of the areas, if appropriate. If necessary, signs will be installed on the barriers designating the areas as restoration sites that need to be protected from disturbance.

The restoration areas will be monitored regularly, and periodic weed control and erosion control measures applied, as specified in the following section.

5.0 RESTORATION MONITORING AND MAINTENANCE

5.1 PERFORMANCE CRITERIA

Restoration programs require the development of performance criteria to evaluate the progress and success of restoration activities, and to guide the implementation of remedial measures or contingency actions when the criteria are not being met. The goals of restoration are to control erosion and to establish self-sustaining native plant communities that develop the characteristics of neighboring natural habitats. Specific objectives to be met in this restoration program over a monitoring period of 5 years are outlined below.

Erosion Control and Soil Stabilization. All erosion control structures should be maintained and soil stabilization measures will be performed until revegetation results in adequate protective cover. Landslides, gullying, or blowouts will be prevented, and topsoil in the restoration sites will be maintained in a stable condition and not subject to excessive water and wind erosion.

Revegetation of Restoration Areas. The restoration sites will attain 30 percent or more total vegetation cover in the first year, increasing to 40 percent in the second year, and thereafter to 50 percent or more. The cover of native perennials will increase from 10 percent or more in the second year to 40 percent or more by the fifth year. By the end of the program, species richness and cover in the revegetation areas will be increasingly comparable to adjacent natural areas.

Exotics Control. By the end of the program, the cover of invasive exotic plants will not exceed that in adjacent natural areas. Exotic species include iceplant, veldt grass, and narrow-leaved iceplant (*Conicosia pugioniformis*). Weedy species will not threaten the recovery of native species in the restoration area and will not invade adjacent natural areas.

5.2 MONITORING ACTIVITIES

The objectives of monitoring are to document the establishment of native vegetation and identify areas that may need maintenance or further revegetation. Monitoring will consist of qualitative and quantitative evaluations of vegetation development at the restoration sites over a period of 5 years.

Qualitative monitoring will take place at a minimum biannually or after major storm events, and will include walking the site to observe and document general vegetation development, animal activity, invasion of weedy species in the restoration areas, and potential erosion problems. Permanent photopoints for qualitative monitoring will be established to document changes consistently over time, and to allow direct comparability between years.

Quantitative monitoring will be carried out once a year. If the restoration sites are small in area, estimates of plant species richness and cover will be derived from visual inspection of each area taken as a whole. If appropriate, for larger sites, vegetation data can be collected at monitoring stations such as transects and/or plots. These quantitative monitoring methods may be repeated in representative reference areas adjacent to or near the restoration sites for comparative purposes. Descriptive and comparative analyses will be conducted, for example to compare native versus nonnative species cover in the revegetation and reference areas.

Monitoring reports will be prepared and submitted each year to the Vandenberg AFB botanist (30 CES/CEVPN). The reports will summarize restoration activities and monitoring data collected during the previous year, and will compare results against the performance criteria specified for the program to evaluate restoration success. The annual reports will recommend continuing maintenance activities and remedial or corrective measures, if needed, and will specify when such measures should be implemented. These reports also will include the photodocumentation results.

5.3 MAINTENANCE AND REMEDIAL MEASURES

Maintenance of the restoration sites will be carried out periodically to repair or replace erosion control structures and soil stabilization treatments, repair fences or barriers, and control the spread of invasive exotic species. Remedial measures will be applied as necessary during the course of the restoration program whenever performance criteria are not met, as identified during monitoring. These remedial measures may include reseeding, replanting, and restabilization of bare areas, if necessary.

6.0 RESTORATION PROGRAM SCHEDULE

After conducting post-construction inspections, the restoration plan will be finalized, and restoration procedures implemented. This will be followed by a minimum of 5 years of monitoring, maintenance, and report preparation.

The optimum time to collect seed and planting material is in the summer and fall. Erosion control, initial exotics control, seeding plant species, planting, and soil stabilization will be completed no later than the winter following construction, preferably before the rainy period begins. If construction is delayed beyond the summer and fall, it may be necessary to postpone revegetation activities until the next season appropriate for collection, seeding, and planting.

Qualitative monitoring will take place at a minimum biannually. Erosion control monitoring and maintenance will be carried out biannually in early winter and spring, or after major storm events, when erosion problems are most likely to occur. Weed control monitoring and maintenance also will follow this schedule, because winter and spring are the growing season for weeds, when they are most likely to be detectable as well as susceptible to treatment. Weed control treatments will be most effective before

the weeds set seed. As a part of qualitative monitoring, photographs will be taken from the photopoints twice each year, in spring and fall. Quantitative monitoring will be carried out once each year in the spring or summer when most species flower or are identifiable. The timing of all monitoring and maintenance activities may vary from year to year depending on seasonal and environmental conditions. Annual monitoring reports will be prepared and submitted by the end of each fiscal year.

7.0 PERSONS AND AGENCIES CONTACTED

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8.0 REFERENCES

California Department of Fish and Game (CDFG). 2001. Special Plants and Animals: Surf and Tranquillion Mountain USGS Quadrangles. California Natural Diversity Data Base.

Christopher, S.V. 1996. Reptiles and amphibians of Vandenberg Air Force Base, Santa Barbara County, California. Museum of Systematics and Ecology, Report No. 4, University of California, Santa Barbara, in cooperation with the National Biological Service, San Simeon.

Coulombe, H.N., and C.R. Mahrdt. 1976. Ecological assessment of Vandenberg Air Force Base, California. Vol. II: Biological Inventory 1974/75. Prepared for: U.S. Air Force, Headquarters, Space and Missile Systems Org., Air Force Systems Command, Los Angeles Air Force Station, California. Prepared by: San Diego State University, Center for Regional Environmental Studies. 199 pp.

Hickman, J.C. (Ed.). 1993. *The Jepson Manual, Higher Plants of California.* University of California Press, Berkeley, California.

Holmgren, M.A., and P.W. Collins. 1999. Final report on the distribution and habitat associations of six bird species of special concern at Vandenberg Air Force Base, Santa Barbara County, California. Prepared for Vandenberg Air Force Base, 30CES/CEVPN, Natural Resources, Vandenberg Air Force Base, California. Santa Barbara Museum of Natural History Monographs No. 1, Studies in Biodiversity No. 1. 204 pp.

Hunt, L.E. 1990. Aquatic and terrestrial vertebrates in the Santa Ynez River system potentially affected by flood control practices west of Lompoc, Santa Barbara County, California. Prep. For SB County Flood Control District and Dames & Moore, Goleta, California. 33 pp.

Romero, N. 1993. Overview of an effective management plan for the Santa Ynez River watershed with an emphasis in restoration of the steelhead fishery. B.A. Thesis, University of California, Santa Barbara.

Science Applications International Corporation (SAIC). 2002. Assessment of wetland habitats at the 13th Street Bridge crossing of the Santa Ynez River, Vandenberg AFB, California. Santa Barbara, California. Unpublished Report.

Shipman, G.E. 1972. Soil survey of Santa Barbara County, northern Santa Barbara area. U.S. Department of Agriculture, Soil Conservation Service. Washington D.C.

Shipman, G.E. 1981. Soil survey of Santa Barbara County, south coastal part. U.S. Department of Agriculture, Soil Conservation Service. Washington D.C.

Swift, C.C., P. Duangsitti, C. Clemente, K. Hasserd, and L. Valle. 1997. Final Report Biology and distribution of the tidewater goby, *Eucyclogobius newberryi*, on Vandenberg Air Force Base, Santa Barbara County, California. Department of Biology, Loyola Marymount University, Los Angeles, California. 44 pp.

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Final
Environmental Assessment

13th Street Bridge
Emergency Repair and Retrofit

Vandenberg Air Force Base
California

Appendix E
Biological Monitoring Reports
Emergency Repair
and Temporary Shoring

SRS TECHNOLOGIES

SUMMARY OF MONITORING ACTIVITIES
13TH STREET BRIDGE EMERGENCY REPAIR
20 DECEMBER 2002 TO 17 JANUARY 2003
VANDENBERG AIR FORCE BASE
CALIFORNIA

SRS Technologies (SRS) was tasked by the Air Force with the biological monitoring for construction activities associated with the emergency repair of the 13th Street Bridge over the Santa Ynez River on Vandenberg Air Force Base, California. Construction activities were initiated on 20 December 2002 and lasted through 17 January 2003.

SRS provided biological monitors permitted by the U.S. Fish and Wildlife Service to handle, capture and relocate the following special status species:

- Southern steelhead (*Oncorhynchus mykiss*) – Federally endangered
- Tidewater goby (*Eucyclogobius newberryi*) – Federally endangered
- California red-legged frog (*Rana aurora draytonii*) – Federally threatened

In addition, SRS provided trained biologists to monitor construction activities and prevent or minimize the impacts of those activities within the project area. Monitors arrived on site each day construction was occurring approximately 30 minutes prior to the beginning of activities and departed no earlier than when construction activities within the riverbed and riparian corridor ceased for each day.

Monitoring activities conducted to protect special status species included:

- Pre-construction survey to document the presence of California red-legged frogs in the vicinity of and within the project area.
- Pre-construction survey to document the presence of Southern steelhead and tidewater gobies.
- Monitoring of all construction activities, i.e. excavation, rock riprap placement, vegetation removal, and installation of the temporary K-rails to temporarily contain the river flow outside the construction zone, to prevent direct adverse impacts to special status species.
- Monitoring turbidity of water within and outside the construction zone.
- Placement of silt fencing on the northern riverbank to minimize erosion and sediment deposition during the construction activities.

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- Periodic night surveys to document the presence of California red-legged frogs within the project area.
- Capture of California red-legged frogs and relocation outside the project area.
- Placement of block nets downstream of the project area to prevent Southern steelhead and tidewater gobies from accessing the construction zone.
- Sieving of the construction area within the riverbed to capture tidewater gobies and relocate them downstream of the project area.
- Monitor construction activities to minimize the removal of native vegetation.

SUMMARY OF MONITORING ACTIVITIES

20 December 2002

- Night frog survey in the 13th St. Bridge area for presence of California red-legged frog (CRLF)
    - Three hour survey included areas within 20 feet of the north shore due to high flow. Survey extended 1,200 feet upstream and 675 feet downstream.
    - Only frog observed in area was Pacific treefrog (*Hyla regilla*).

21 December 2002

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- River channel (within project footprint) was visually surveyed for presence of tidewater goby and southern steelhead.
- Monitored construction activities for remainder of the day.

22 December 2002

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Monitored construction activities for remainder of the day.
- Relocated one Pacific treefrog from upper bank construction area.

23 December 2002

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Seine survey of stream channels in preparation for the installation of the K-rails. Fifteen tidewater gobies captured and relocated downstream.
- Monitored construction activities for remainder of the day.
- One bullfrog (*Rana catesbeiana*) removed from the pile of debris.

- Night CRLF survey for presence in project area. None found. Survey included mid channel and shore and extended 1,200 feet upstream and 600 feet downstream. None found.

24 December 2002

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Monitored construction activities for remainder of the day.
- Seined project footprint prior to construction equipment entering area. Ninety-nine tidewater gobies captured and relocated downstream.

25 December 2002

- No construction work occurred on this day.

26 December 2002

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Monitored construction activities for remainder of the day (Tony Durham, Rosemary Thompson, Camm Swift).
- Seined project footprint prior to construction equipment entering area.
    - Eighty-four tidewater gobies captured and relocated downstream.

27 December 2002

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Monitored construction activities for remainder of the day.
- Temporary K-rail barrier installed.
- Previous main channel under the bridge between northern abutment and pier 7 now a backwater. Block net installed at lower end (downstream) to prevent steelhead from entering area.
- Seined project footprint prior to construction equipment entering area.
    - Fifty-six tidewater gobies captured and relocated downstream.

28 December 2002

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Monitored construction activities for remainder of the day.
- Block net installed at lower end (downstream) to prevent steelhead from entering area.
- Thoroughly seined entire project area.
    - 224 tidewater gobies captured and relocated downstream.

- CRLF observed during construction when vegetation was being removed from pier 8.
    - Twelve CRLF captured and relocated downstream.
    - Three Pacific treefrogs captured and relocated.
    - Removed two bullfrogs.

29 December 2002

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Monitored construction activities for remainder of the day.

30 December 2002

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Monitored construction activities for remainder of the day.
- Night frog survey within project footprint.
    - Captured and relocated one CRLF to Bear Creek Pond.
    - Removed one bullfrog.

31 December 2002

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Monitored construction activities for remainder of the day.

1 January 2003

- No construction work occurred on this day.
- Night frog survey within project footprint.
    - Removed one bullfrog.

2 January 2003

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Monitored construction activities for remainder of the day.
- Night frog survey within project footprint.
    - One Pacific treefrog captured and relocated
    - Observed one CRLF but was unable to capture.

3 January 2003

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Monitored construction activities for remainder of the day.
- Night frog survey within project footprint.
    - Removed one bullfrog.
    - Observed one CRLF but was unable to capture.

4 January 2003

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Monitored construction activities for remainder of the day.
    - Removed one bullfrog.
- Night frog survey within project footprint.
    - Relocated one CRLF to Bear Creek Pond.
    - Removed four bullfrogs.

5 January 2003

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Monitored construction activities for remainder of the day.
    - One California king snake (*Lampropeltis getulus californiae*) fatally injured by equipment.
    - One Western fence lizard (*Sceloporus occidentalis*) captured and relocated outside of work area.

6 January 2003

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Monitored construction activities for remainder of the day.
- Night frog survey of project footprint.
    - One bullfrog observed but unable to capture.

7 January 2003

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Monitored construction activities for remainder of the day.

8 January 2003

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Monitored construction activities for remainder of the day.

9 January 2003

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Monitored construction activities for remainder of the day.

10 January 2003

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Monitored construction activities for remainder of the day.

11 January 2003

- No construction work occurred on this day.

12 January 2003

- No construction work occurred on this day.
- Night frog survey of project footprint.

13 January 2003

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Seined the river adjacent to the K-rails prior to any plastic removal.
    - One tidewater goby captured and relocated downstream.
- Monitored construction activities for remainder of the day.

14 January 2003

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Block nets were removed from downstream of work area prior to removing the K-rails.
- A 150-foot section of the temporary channel upstream of the bridge and a 30-foot section of the temporary channel downstream of the bridge were closed off with a block net and seined to facilitate access to pier 6 for debris removal.
    - Approximately 1,100 tidewater gobies were captured and relocated downstream.
- Monitored construction activities for remainder of the day.

15 January through 17 January 2003

- No work occurred within riverbed, thus monitoring for CRLF not required.
- Monitored construction activities to ensure compliance with project guidelines.

RECOMMENDATIONS

Monitoring activities during the emergency repair indicated that monitoring and minimization measures implemented were adequate and effective in protecting special status species present within the construction area. The following measures are recommended to further enhance this protection:

- The construction contractor should provide monitors with a schedule of planned daily work so that pre-construction activities surveys are planned more efficiently.
- Surveys for California red-legged frogs should begin one week prior to start of construction activities, to meet recommended USFWS protocols for field surveys and to better assess the presence/absence of California red-legged frogs,
- Obtain permission from the USFWS to relocate California red-legged frogs to suitable habitat outside of the immediate project vicinity, i.e. Bear Creek Pond.
- Brush piles of removed vegetation should be removed from the active construction zone immediately to prevent the movement of special status wildlife species into these piles.

Because of the need for some of the construction equipment, such as backhoes and excavators, to move within and throughout the construction zone, the use of protective mats for equipment operating within the riverbed was not feasible. The use of these protective mats during the bridge retrofit should be limited to stationary equipment operating within the riverbed. Non-stationary equipment should be operated on established temporary access roads whenever possible, and the time it is operated outside of these roads should be minimized to the greatest extent possible.

SUMMARY OF MONITORING ACTIVITIES
13TH STREET BRIDGE TEMPORARY SHORING PROJECT
APRIL 14-25, 2003
VANDENBERG AIR FORCE BASE
CALIFORNIA

SRS Technologies (SRS) was tasked by the Air Force with the biological monitoring for construction activities associated with the emergency shoring of the 13th Street Bridge over the Santa Ynez River on Vandenberg Air Force Base, California. Construction activities were initiated on 14 April 2003 and lasted through 25 April 2003.

SRS provided biological monitors approved by 30th CES/CEVPN, NOAA National Marine Fisheries Service and the U.S. Fish and Wildlife Service to handle, capture and relocate the following special status species:

- Southern steelhead (*Oncorhynchus mykiss*) – Federally endangered
- Tidewater goby (*Eucyclogobius newberryi*) – Federally endangered
- California red-legged frog (*Rana aurora draytonii*) – Federally threatened

In addition, SRS provided trained biologists to monitor construction activities and prevent or minimize the impacts of those activities within the project area. Monitors arrived on site approximately 30 minutes prior to the start of construction activities and departed when construction activities within the riverbed and riparian corridor ended for the day.

Monitoring activities we conducted to protect special status species included:

- Pre-construction survey to document the presence of California red-legged frogs in the project area.
- Pre-construction survey to document the presence of Southern steelhead and tidewater gobies.
- Pre-construction survey to document the presence of breeding birds in the project area.
- Monitoring of all construction activities, i.e. excavation, rock riprap removal, vegetation removal, and installation of temporary culverts to contain the river flow through work area, to prevent direct adverse impacts to special status species.
- Monitoring turbidity of water within and outside the construction zone, to prevent direct adverse impacts to special status species.
- Night surveys to document the presence of California red-legged frog within the project area.
- Capture of California red-legged frogs and relocation outside the project area.

- Placement of block nets downstream of the project area to prevent Southern steelhead and tidewater gobies from accessing the construction zone.
- Seining of the construction area within the riverbed to capture tidewater gobies and relocate them downstream of the project area.
- Monitor construction activities to minimize the impact of removing native vegetation.

summary of monitoring activities

SRS provided biological monitors to survey swallow activity at the bridge. Surveys were conducted over a four-day period. Swallows were observed building and repairing nests between piers 6 and 8. Swallows appeared to be unaffected by the noise deterrent system set up to discourage them from using the bridge, however when the system was removed, swallow activity at the bridge doubled. Fresh bat guano was observed on the fourth day between piers 3 through 6. Swallow numbers varied throughout construction period.

14 April 2003

- First day of construction. Construction personnel set up staging area and began putting up silt fencing around work area.
- Breeding bird survey conducted in the 13th Street Bridge area in the south end willow stands for the presence of special status species. No breeding evidence observed.
- Night frog survey in the 13th St. Bridge area for presence of California red-legged frog (CRLF).
    - No CRLF found under bridge or in workspace.
    - 2 CRLF singing and 7 pairs of eye shine seen in drainage pond southeast of the 13th St. Bridge approximately 200-300 feet from construction area. The pond is outside of temporary shoring work boundaries therefore CRLF were not captured and relocated.

15 April 2003

- Block nets set at both ends of the channel and seined between nets. No tidewater gobies found.
- Previous secondary channel under the bridge between pier 9 and pier 8 now backwater. Block net installed at lower end (downstream) to prevent steelhead from entering area.
- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Relocated one Pacific treefrog (*Hyla regilla*) from construction area.

- Monitored construction activities for remainder of the day.

16 April 2003

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Breeding bird survey conducted in the 13th Street Bridge area in the south end willow stands for the presence of special status species. No breeding evidence observed.
- Seine survey of stream channels in preparation for construction vehicle crossing and river diversion. Seined where diversion was to be placed and upstream along secondary river channel to north river bank. Thirteen tidewater gobies captured and released downstream of bridge. Block net installed downstream to prevent entry of native fish into still water created by backflow of the river upstream.
- Willow stands on south end of bridge were removed.
- Beaver (*Castor canadensis*) observed swimming downstream in south channel.
- Monitored construction activities for remainder of the day.

17 April 2003

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Seined under bridge in the south channel cut off by the diversion of the river. Twenty tidewater gobies captured and released downstream of bridge.
- Completion of two access roads on either side of the bridge running from north to south bank.
- Monitored construction activities for remainder of the day.
    - One California king snake (*Lampropeltis getulus californiae*) captured and relocated outside of work area.

18 April 2003

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Monitored construction activities for remainder of the day.

21 April 2003

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Removal of rock around bridge abutments continued.

- Monitored construction activities for remainder of the day.

22 April 2003

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Monitored construction activities for remainder of the day.

23 April 2003

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Monitored construction activities for remainder of the day.

24 April 2003

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Drainage pond on southeast side of bridge 2 adult CRLF observed. Outside of temporary shoring work boundaries therefore CRLF were not captured and relocated.
- Monitored construction activities for remainder of the day.

25 April 2003

- Checked immediate construction area under bridge for presence of CRLF before crew arrived on site. None found.
- Drainage pond on southeast side of bridge 4 adult CRLF observed. Outside of temporary shoring work boundaries therefore CRLF were not captured and relocated.
- Relocated one Pacific treefrog captured and released outside the construction area.
- Monitored construction activities for remainder of the day.

28 April 2003

- No construction work occurred on this day and will not resume until further notice.
- One of the culverts blocked by a beaver dam. Monitors removed debris to allow flow through culvert.

monitoring results

The following special status species were captured and relocated outside the construction zone during the emergency shoring project:

- Tidewater goby: 33
  All tidewater gobies were relocated downstream of the construction area.
- No CRLF were found within the construction area. Fifteen CRLF observations were recorded in the drainage pond to the southeast of the bridge. The pond is located outside immediate construction boundaries therefore CRLF were not captured and relocated.

Monitoring activities during the emergency shoring indicated that monitoring and minimization measures implemented were adequate and effective in protecting special status species present within the construction area. No loss of individuals occurred within the work area due to excavation, crushing or burial, or in habitats adjacent to the work area due to soil erosion.

recommendations

- It is recommended that the culvert pipes placed under the bridge to divert flow be checked for debris blockage weekly and following each rain until pipes are removed.

- In the future, willow removal should be hand-cleared to allow CRLF monitors to survey the area prior to equipment entering the site. Clearing the site using excavators and backhoes makes it difficult for the biological monitor to observe CRLF and other species that may be present in thick vegetation.

- A small drainage creek flows between abutment 1 and pier 2 on the south side of the Santa Ynez River. The creek flows from a pond on the southeast of the bridge and creates a marsh downstream connecting it to the main channel. CRLF are known to occur in the pond and may be adversely impacted by construction adjacent to the pond or near the creek. In addition, the marsh area downstream may be adversely impacted if flow from the creek is interrupted; therefore construction planned for this area should include containment of the creek

Final
Environmental Assessment

13th Street Bridge
Emergency Repair and Retrofit

Vandenberg Air Force Base
California

Appendix F
Air Quality Analysis

Appendix F – Air Quality Analysis

Technical Assumptions and Emission Calculation

Usage information was obtained from 30 CES personnel involved with preparing the engineering analysis for the repair and reinforcement of the 13th Street Bridge. The Proposed Action is an emergency repair and temporary shoring to ensure the bridge will remain standing during the 2002-2003 rainy season and support heavy payload transport, and a proposed retrofit of the bridge to withstand the normal traffic. The contractor supplied the equipment usage for the emergency repair, while 30th CES personnel estimated the equipment usage for temporary shoring and for the proposed retrofit. The detailed analysis of the equipment used in the emergency repair is presented in Table F-1, while the detailed analysis of the equipment estimated to be used in the temporary shoring is presented in Table F-2. The detailed analysis of the estimated equipment usage in the proposed retrofit is presented in Table F-3 and the emission factors used to estimate the emissions are presented in Table F-4. Even with the detailed information, numerous assumptions were made to estimate the emissions from proposed action.

Table F-1. Proposed Action Emergency Repair Equipment Usage.

Emission Source	Fuel	Power Rating (HP)	Load Factor	Number	Daily (Hours)	Days	Project Usage (Hours)
Backhoe, Cat 430D	D	98	0.465	1	8.0	30	21
Bulldozer, Track, John Deere 450H	D	74	0.59	1	8.0	30	87
Compactor Ingersol Rand, SD-40	D	80	0.66	1	8.0	30	18
Dump Truck Articulating Cat D-350	D	383	0.47	1	8.0	30	98
Excavator, Track Gradall 5200XL	D	174	0.58	1	8.0	30	34
Excavator, Track Hitachi EX370	D	184	0.58	1	8.0	30	102
Excavator, Track Komatsu P220LC-6	D	158	0.58	1	8.0	30	67
Loader, Wheeled, Cat 966G	D	184	0.465	1	8.0	30	129
Loader, Wheeled, Komatsu WA450	D	260	0.465	1	8.0	30	102
Motor Grader Cat 140H	D	138	0.575	1	8.0	30	9
Water Truck Ford L-800	D	210	0.47	1	8.0	30	23
Miscellaneous Delivery Trucks[(a)]	NA	60	NA	6	NA	30	10,800
Rock Delivery Truck[(a)]	NA	60	NA	8	NA	30	14,400
Pick-up Truck[(a)]	NA	15	NA	4	NA	30	1,800
Worker Commuting[(a)]	NA	15	NA	10	NA	30	4,500
Fugitive Dust[(b)] - Peak Day	NA	1.61	NA	NA	NA	1	NA
Fugitive Dust[(b)] - Average Day	NA	1.07	NA	NA	NA	30	NA

Notes:
(a) Power Rating is the number of miles traveled in a one-way trip. Number is the number of one-way trips. Project Usage is for total mileage.
(b) Power Rating is acres disturbed per day.

Table F-2. Proposed Action Temporary Shoring Equipment Usage.

Emission Source	Fuel	Power Rating (HP)	Load Factor	Number	Daily (Hours)	Days	Project Usage (Hours)
Bulldozer, Track Cat D6R	D	175	0.59	2	8.0	6	96
Bulldozer, Track Cat D8R	D	515	0.59	1	8.0	3	24
Crane, 25 Ton RT552	D	152	0.43	1	8.0	4	32
Crane, 75 Ton RT875	D	250	0.43	1	8.0	4	32
Dump Truck Articulating, Volvo A35D	D	387	0.47	3	8.0	2	48
Excavator, Track Cat 330C	D	184	0.58	2	8.0	8	128
Forklift, Gradall, 544D	D	125	0.30	2	8.0	4	64
Loader, Wheeled Cat 966G	D	184	0.47	2	8.0	12	192
Motor Grader, Cat 140H	D	138	0.58	1	8.0	11	88
Water Truck, Mack DMM600S	D	310	0.47	1	3.0	42	126
Miscellaneous Delivery Trucks[(a)]	NA	60	NA	6	NA	21	7,560
Rock Delivery Truck[(a)]	NA	60	NA	8	NA	50	24,000
Pick-up Truck[(a)]	NA	15	NA	4	NA	42	2,520
Worker Commuting[(a)]	NA	15	NA	10	NA	42	6,300
Car Traffic Reroute[(a)] Weekday	NA	7	NA	2900	NA	30	609,000
Car Traffic Reroute[(a)] Weekend	NA	7	NA	800	NA	12	67,200
Fugitive Dust[(b)] - Peak Day	NA	3.25	NA	NA	NA	1	NA
Fugitive Dust[(b)] - Average Day	NA	2.17	NA	NA	NA	42	NA

Notes:
(a) Power Rating is the number of miles traveled in a one-way trip. Number is the number of one-way trips. Project Usage is for total mileage.
(b) Power Rating is acres disturbed per day.

Table F-3. Proposed Action Bridge Retrofit Equipment Usage.

Emission Source	Fuel	Power Rating (HP)	Load Factor	Number	Daily	Days	Project Usage (Hours)
Air Compressor	D	75	0.48	2	4.0	90	720
Backhoe/Skiploader 410G	D	98	0.465	3	6.8	90	1,836
Bulldozer, Track, John Deere 450H	D	74	0.59	2	2.0	90	360
Chainsaw	G	5	0.85	2	4.0	2	16
Compactor Ingersol Rand, SD-40	D	80	0.66	1	2.0	90	180
Concrete Boom Truck	D	250	0.47	2	2.0	90	360
Concrete Coring Equipment	D	50	0.48	1	0.8	90	72
Crane, 25 Ton RT552	D	152	0.43	1	6.8	90	612
Crane, 75 Ton RT875	D	250	0.43	2	6.8	90	1,224
Electrical Generator	G	5	0.74	4	7.2	90	2,592
Dump Truck Articulating Cat D-350	D	383	0.47	2	2.4	90	432
Excavator, Track Hitachi EX370	D	184	0.58	4	6.8	90	2,448
Forklift, PD155H	D	114	0.3	1	6.0	90	540
Pile Driver/Auger RX2300	D	143	0.75	2	4.0	90	720
Pressure Grouting Equipment	D	50	0.48	1	2.0	25	50
Pump, Dewatering	G	15	0.74	4	6.4	90	2,304
Loader, Wheeled, Cat 966G	D	184	0.465	2	4.0	90	720
Sheet Pile Driver RX2300	D	143	0.75	1	2.0	90	180
Water Truck	D	250	0.47	1	6.8	90	612
Work Lift (manlift) TL3100	D	50	0.3	2	6.8	90	1,224
Flatbed Truck[(a)]	D	30	NA	4	6.0	90	10,800
Miscellaneous Delivery Trucks[(a)]	NA	60	NA	4	NA	90	21,600
Pile Delivery Truck[(a)]	NA	60	NA	3	1.6	90	16,200
Ready Mix Truck[(a)]	NA	30	NA	4	2.4	90	10,800
Rock Delivery Truck[(a)]	NA	60	NA	8	2.0	90	43,200
Pick-up Truck[(a)]	NA	15	NA	3	NA	90	4,050
Worker Commuting[(a)]	NA	15	NA	30	NA	150	34,275
Car Traffic Reroute[(a)] Weekday	NA	7	NA	2900	NA	108	2,192,400
Car Traffic Reroute[(a)] Weekend	NA	7	NA	800	NA	42	235,200
Fugitive Dust[(b)] - Peak Day	NA	3.25	NA	NA	NA	1	NA
Fugitive Dust[(b)] - Average Day	NA	2.17	NA	NA	NA	150	NA

Notes:

(a) Power Rating is the number of miles traveled in a one-way trip. Number is the number of one-way trips. Project Usage is total mileage.

(b) Power Rating is acres disturbed per day.

Table F-4. Emission Factors Used to Estimate Emissions.

Emission Source	Emission Factors(gm/hr-hr)					Vehicle Category[a]
	CO	NO_x	PM_{10}	ROC	SO_x	
Air Compressor	3.03	11.2	0.95	1.27	0.21	Industrial
Backhoe/Skiploader	2.71	8.8	0.76	1.12	0.19	Wheeled Loader
Bulldozer	2.15	8.8	0.66	0.88	0.19	Track-type Tractor
Chainsaw	198	4.79	0.30	6.13	0.26	Gas Misc.
Compactor, Vibrating	4.6	8.8	0.86	1.16	0.21	Miscellaneous
Concrete Boom Truck	2.28	11	0.48	0.57	0.20	Off-Highway Truck
Concrete Coring Equipment	198	4.79	0.30	6.13	0.26	Gas Misc.
Crane	4.6	8.8	0.86	1.16	0.21	Miscellaneous
Electrical Generator	198	4.79	0.30	6.13	0.26	Gas Misc.
End Dump Truck	2.28	11	0.48	0.57	0.20	Off-Highway Truck
Excavator	2.15	8.8	0.66	0.88	0.19	Track-type Tractor
Forklift	4.6	8.8	0.86	1.16	0.21	Miscellaneous
Pile Driver/Auger	4.6	8.8	0.86	1.16	0.21	Miscellaneous
Pressure Grouting Equipment	198	4.79	0.3	6.13	0.26	Gasoline Misc.
Pump, Dewatering	198	4.79	0.3	6.13	0.26	Gasoline Misc.
Rubber Wheel Haulers (Polaris)	198	4.79	0.30	6.13	0.26	Gasoline Misc.
Rubber Wheel Loader	2.71	8.8	0.76	1.12	0.19	Wheeled Loader
Sheet Pile Driver	4.6	8.8	0.86	1.16	0.21	Miscellaneous
Sweeper	198	4.79	0.30	6.13	0.26	Gas Misc.
Track Loader	2.26	8.8	0.62	1.15	0.19	Track type Loader
Water Truck (2,500 gallon)	2.28	11	0.48	0.57	0.20	Off-Highway Truck
Work Lift (manlift)	3.03	11.2	0.95	1.27	0.21	Industrial
Flatbed Truck[b]	0.025508	0.031208	0.001003	0.003362	0.000241	EMFAC2002
Miscellaneous Delivery Trucks[b]	0.025508	0.031208	0.001003	0.003362	0.000241	EMFAC2002
Pile Delivery Truck[b]	0.025508	0.031208	0.001003	0.003362	0.000241	EMFAC2002
Ready Mix Truck[b]	0.025508	0.031208	0.001003	0.003362	0.000241	EMFAC2002
Rock Delivery Truck [b]	0.025508	0.031208	0.001003	0.003362	0.000241	EMFAC2002
Pick-up Truck[b]	0.01815	0.002014	0.000112	0.001935	0.00001	EMFAC2002
Worker Commuting[b]	0.01815	0.002014	0.000112	0.001935	0.00001	EMFAC2002
Fugitive Dust[c]	0.00	0.00	10.91	0.00	0.00	

Notes:
(a) Emission factors from SBCAPCD Form 24, controlled emissions.
(b) Emission factor from SCAQMD CEQA On-Road Vehicles 2003 are in lbs/mile.
(c) Emission factor is uncontrolled is in units of lbs/acre-hr.

Proposed Action

It was assumed that the average workday would be eight hours. For employee commuting, the average one-way commute was assumed to 15 miles and for work trucks were assumed to drive 15 miles per day. All supply trucks were assumed to travel 60 miles, while concrete trucks were assumed to travel 30 miles. For the temporary shoring and proposed retrofit, traffic estimates for the Solvang Gate were obtained from the Base Traffic Engineer. It was assumed that all traffic through the Solvang Gate would cross the 13th Street Bridge. On the average workday, approximately 2,900 vehicles cross the bridge, while on the weekends, only 800 vehicles cross the bridge. Because the bridge would be closed, traffic would have to be rerouted. It was assumed that all vehicles would use the Lompoc Gate and travel on Santa Lucia Canyon Road to Central Avenue, to Union Sugar Avenue, to Highway 246, to the South Gate. It is estimated the detour would increase the trip length by seven miles.

Maps were used to estimate the area disturbed by the construction equipment. It was assumed that for a reasonable worst-case day, half the area would be disturbed, while for the average, one-third of the area would be disturbed.

The emissions from the various sources were estimated on daily and project basis. The daily emissions were calculated by multiplying the emission factor by the appropriate equipment usage rate. Except for the PM_{10} emissions, the project emissions were estimated by multiplying the daily emissions for each source by the duration of the project. For the PM_{10} emissions, the project emissions were obtained by multiplying the average area disturbed by the length of the day and the duration of the project. Daily and project construction emissions for the emergency action are presented in Tables F-5 and F-6, respectively, while daily and project construction emissions for the temporary shoring action are presented in Tables F-7 and F-8. Daily and project emissions for the proposed retrofit are presented in Tables F-9 and F-10, respectively. The cumulative emissions from the emergency repair and the proposed retrofit are also presented in Table F-10.

Table F-5. Proposed Action Emergency Repair Daily Emissions.

Emission Source	Daily Emissions (Lbs)				
	CO	NO_X	PM_{10}	ROC	SO_X
Backhoe, Cat 430D	2.2	7.1	0.6	0.9	0.2
Bulldozer, Track, John Deere 450H	1.7	6.8	0.5	0.7	0.1
Compactor Ingersol Rand, SD-40	4.3	8.2	0.8	1.1	0.2
Dump Truck Articulating Cat D-350	7.2	34.9	1.5	1.8	0.6
Excavator, Track Gradall 5200XL	3.8	15.7	1.2	1.6	0.3
Excavator, Track Hitachi EX370	4.0	16.6	1.2	1.7	0.4
Excavator, Track Komatsu P220LC-6	3.5	14.2	1.1	1.4	0.3
Loader, Wheeled, Cat 966G	4.1	13.3	1.1	1.7	0.3
Loader, Wheeled, Komatsu WA450	5.8	18.8	1.6	2.4	0.4
Motor Grader Cat 140H	2.2	12.3	0.8	0.6	0.3
Water Truck Ford L-800	4.0	19.1	0.8	1.0	0.3
Miscellaneous Delivery Trucks	9.2	11.2	0.4	1.2	0.1
Rock Delivery Truck	12.2	15.0	0.5	1.6	0.1
Pick-up Truck	1.1	0.1	0.0	0.1	0.0
Worker Commuting	2.7	0.3	0.0	0.3	0.0
Fugitive Dust	0.0	0.0	140.6	0.0	0.0
Total	***67.9***	***193.6***	***152.9***	***18.1***	***3.7***

Table F-6. Proposed Action Emergency Repair Total Emissions.

Emission Source	Project Emissions (Lbs)				
	CO	NO_X	PM_{10}	ROC	SO_X
Backhoe, Cat 430D	5.7	18.6	1.6	2.4	0.4
Bulldozer, Track, John Deere 450H	18.0	73.7	5.5	7.4	1.6
Compactor Ingersol Rand, SD-40	9.6	18.4	1.8	2.4	0.4
Dump Truck Articulating Cat D-350	88.7	427.8	18.7	22.2	7.8
Excavator, Track Gradall 5200XL	16.3	66.6	5.0	6.7	1.4
Excavator, Track Hitachi EX370	51.6	211.2	15.8	21.1	4.6
Excavator, Track Komatsu P220LC-6	29.1	119.1	8.9	11.9	2.6
Loader, Wheeled, Cat 966G	65.9	214.1	18.5	27.3	4.6
Loader, Wheeled, Komatsu WA450	73.7	239.2	20.7	30.4	5.2
Motor Grader Cat 140H	2.4	13.9	0.9	0.7	0.3
Water Truck Ford L-800	11.4	55.1	2.4	2.9	1.0
Miscellaneous Delivery Trucks	275.5	337.0	10.8	36.3	2.6
Rock Delivery Truck	367.3	449.4	14.4	48.4	3.5
Pick-up Truck	32.7	3.6	0.2	3.5	0.0
Worker Commuting	81.7	9.1	0.5	8.7	0.0
Fugitive Dust	0.0	0.0	2,812.7	0.0	0.0
Total (Lbs)	***1,129.6***	***2,256.8***	***2,938.5***	***232.2***	***36.0***
Total (Tons)	***0.56***	***1.13***	***1.47***	***0.12***	***0.02***

Table F-7. Proposed Action Temporary Shoring Daily Emissions.

Emission Source	Daily Emissions (Lbs)				
	CO	NO_X	PM_{10}	ROC	SO_X
Bulldozer, Track Cat D6R	7.8	32.0	2.4	3.2	0.7
Bulldozer, Track Cat D8R	11.5	47.2	3.5	4.7	1.0
Crane, 25 Ton RT552	5.3	10.1	1.0	1.3	0.2
Crane, 75 Ton RT875	8.7	16.7	1.6	2.2	0.4
Dump Truck Articulating, Volvo A35D	21.9	105.9	4.6	5.5	1.9
Excavator, Track Cat 330C	8.1	33.1	2.5	3.3	0.7
Forklift, Gradall, 544D	6.1	11.6	1.1	1.5	0.3
Loader, Wheeled Cat 966G	8.2	26.6	2.3	3.4	0.6
Motor Grader, Cat 140H	2.2	12.3	0.8	0.6	0.3
Water Truck, Mack DMM600S	2.2	10.6	0.5	0.5	0.2
Miscellaneous Delivery Trucks[(a)]	9.2	11.2	0.4	1.2	0.1
Rock Delivery Truck[(a)]	12.2	15.0	0.5	1.6	0.1
Pick-up Truck[(a)]	1.1	0.1	0.0	0.1	0.0
Worker Commuting[(a)]	2.7	0.3	0.0	0.3	0.0
Car Traffic Reroute -Weekday	368.4	40.9	2.3	39.3	0.2
Fugitive Dust	0.0	0.0	283.6	0.0	0.0
Total	***475.7***	***373.7***	***307.1***	***68.9***	***6.7***

Table F-8. Proposed Action Temporary Shoring Total Emissions.

Emission Source	Project Emissions (Lbs)				
	CO	NO_X	PM_{10}	ROC	SO_X
Bulldozer, Track Cat D6R	47.0	192.3	14.4	19.2	4.2
Bulldozer, Track Cat D8R	34.6	141.5	10.6	14.1	3.1
Crane, 25 Ton RT552	21.2	40.6	4.0	5.3	1.0
Crane, 75 Ton RT875	34.9	66.7	6.5	8.8	1.6
Dump Truck Articulating, Volvo A35D	43.9	211.7	9.2	11.0	3.8
Excavator, Track Cat 330C	64.7	265.0	19.9	26.5	5.7
Forklift, Gradall, 544D	24.3	46.6	4.6	6.1	1.1
Loader, Wheeled Cat 966G	98.1	318.7	27.5	40.6	6.9
Motor Grader, Cat 140H	23.7	135.5	9.1	7.1	3.1
Water Truck, Mack DMM600S	92.3	445.2	19.4	23.1	8.1
Miscellaneous Delivery Trucks[(a)]	192.8	235.9	7.6	25.4	1.8
Rock Delivery Truck[(a)]	612.2	749.0	24.1	80.7	5.8
Pick-up Truck[(a)]	45.7	5.1	0.3	4.9	0.0
Worker Commuting	114.3	12.7	0.7	12.2	0.1
Car Traffic Reroute -Weekday	11,053.4	1,226.5	68.2	1,178.4	6.1
Car Traffic Reroute -Weekend	1,219.7	135.3	7.5	130.0	0.7
Fugitive Dust	0.0	0.0	7,941.4	0.0	0.0
Total (Lbs)	***13,722.9***	***4,228.3***	***8,175.0***	***1,593.5***	***53.0***
Total (Tons)	***6.86***	***2.11***	***4.09***	***0.80***	***0.03***

Table F-9. Proposed Action Bridge Retrofit Daily Emissions.

Emission Source	Daily Emissions (Lbs)				
	CO	NO_X	PM_{10}	ROC	SO_X
Air Compressor	1.9	7.1	0.6	0.8	0.1
Backhoe, Cat 430D	5.6	18.0	1.6	2.3	0.4
Bulldozer, Track, John Deere 450H	0.8	3.4	0.3	0.3	0.1
Chainsaw	14.8	0.4	0.0	0.5	0.0
Compactor Ingersol Rand, SD-40	1.1	2.0	0.2	0.3	0.0
Concrete Boom Truck	2.4	11.4	0.5	0.6	0.2
Concrete Coring Equipment	8.4	0.2	0.0	0.3	0.0
Crane, 25 Ton RT552	4.5	8.6	0.8	1.1	0.2
Crane, 75 Ton RT875	14.8	28.4	2.8	3.7	0.7
Electrical Generator	46.5	1.1	0.1	1.4	0.1
Dump Truck Articulating Cat D-350	4.3	21.0	0.9	1.1	0.4
Excavator, Track Hitachi EX370	13.8	56.3	4.2	5.6	1.2
Forklift	2.1	4.0	0.4	0.5	0.1
Loader, Wheeled, Cat 966G	4.1	13.3	1.1	1.7	0.3
Pile Driver/Auger	8.7	16.6	1.6	2.2	0.4
Pressure Grouting Equipment	21.0	0.5	0.0	0.6	0.0
Pump, Dewatering	124.0	3.0	0.2	3.8	0.2
Sheet Pile Driver	2.2	4.2	0.4	0.5	0.1
Water Truck	4.0	19.4	0.8	1.0	0.4
Work Lift (manlift)	1.4	5.0	0.4	0.6	0.1
Flatbed Truck	3.1	3.7	0.1	0.4	0.0
Miscellaneous Delivery Trucks	6.1	7.5	0.2	0.8	0.1
Pile Delivery Truck	4.6	5.6	0.2	0.6	0.0
Ready Mix Truck	3.1	3.7	0.1	0.4	0.0
Rock Delivery Truck	12.2	15.0	0.5	1.6	0.1
Pick-up Truck	0.8	0.1	0.0	0.1	0.0
Worker Commuting	8.2	0.9	0.1	0.9	0.0
Car Traffic Reroute -Weekday	368.4	40.9	2.3	39.3	0.2
Fugitive Dust	0.0	0.0	283.6	0.0	0.0
Total	***692.8***	***301.4***	***304.1***	***73.1***	***5.4***

Table F-10. Proposed Action Bridge Retrofit and Project Total Emissions.

Emission Source	Project Emissions (Lbs)				
	CO	NO_X	PM_{10}	ROC	SO_X
Air Compressor	173.1	640.0	54.3	72.6	12.0
Backhoe, Cat 430D	499.9	1,623.2	140.2	206.6	35.0
Bulldozer, Track, John Deere 450H	74.5	304.9	22.9	30.5	6.6
Chainsaw	29.7	0.7	0.0	0.9	0.0
Compactor Ingersol Rand, SD-40	96.4	184.4	18.0	24.3	4.4
Concrete Boom Truck	212.6	1,025.8	44.8	53.2	18.7
Concrete Coring Equipment	754.3	18.2	1.1	23.4	1.0
Crane, 25 Ton RT552	405.6	776.0	75.8	102.3	18.5
Crane, 75 Ton RT875	1,334.4	2,552.7	249.5	336.5	60.9
Electrical Generator	4,186.3	101.3	6.3	129.6	5.5
Dump Truck Articulating Cat D-350	390.9	1,885.8	82.3	97.7	34.3
Excavator, Track Hitachi EX370	1,238.3	5,068.4	380.1	506.8	109.4
Forklift	187.3	358.3	35.0	47.2	8.6
Loader, Wheeled, Cat 966G	368.0	1,195.1	103.2	152.1	25.8
Pile Driver/Auger	783.1	1,498.1	146.4	197.5	35.8
Pressure Grouting Equipment	523.8	12.7	0.8	16.2	0.7
Pump, Dewatering	11,163.4	270.1	16.9	345.6	14.7
Sheet Pile Driver	195.8	374.5	36.6	49.4	8.9
Water Truck	361.5	1,743.8	76.1	90.4	31.7
Work Lift (manlift)	122.6	453.3	38.5	51.4	8.5
Flatbed Truck	275.5	337.0	10.8	36.3	2.6
Miscellaneous Delivery Trucks	551.0	674.1	21.7	72.6	5.2
Pile Delivery Truck	413.2	505.6	16.2	54.5	3.9
Ready Mix Truck	275.5	337.0	10.8	36.3	2.6
Rock Delivery Truck	1,101.9	1,348.2	43.3	145.2	10.4
Pick-up Truck	73.5	8.2	0.5	7.8	0.0
Worker Commuting	622.1	69.0	3.8	66.3	0.3
Car Traffic Reroute -Weekday	39,792.1	4,415.5	245.5	4,242.3	21.9
Car Traffic Reroute -Weekend	4,268.9	473.7	26.3	455.1	2.4
Fugitive Dust	0.0	0.0	28,362.0	0.0	0.0
Total Proposed Retrofit (Lbs)	***70,475.1***	***28,255.7***	***30,269.9***	***7,650.6***	***490.3***
Total Proposed Retrofit (Tons)	***35.24***	***14.13***	***15.13***	***3.83***	***0.25***
Total Emergency Repair (Tons)	***0.56***	***1.13***	***1.47***	***0.12***	***0.02***
Total Temporary Shoring (Tons)	***6.86***	***2.11***	***4.09***	***0.80***	***0.03***
Grand Total (Tons)	42.66	17.37	20.69	4.74	0.29

Conformity Determination

The U.S. Air Force is required to make a formal conformity analysis to determine whether the Proposed Action of the emergency repair and retrofit of the 13th Street Bridge at Vandenberg Air Force Base, California, complies with the conformity rule found in the Clean Air Act.

Background

The EPA Final Conformity Rule requires federal agencies to ensure that any agency activity conforms to approved state or federal implementation plans. Conformity means ensuring the federal activity will not:

(1) Cause a new violation of the National Ambient Air Quality Standards (NAAQS);

(2) Contribute to an increase in the frequency or severity of violations of existing NAAQS; or

(3) Delay the timely attainment of any NAAQS, interim milestones, or other milestones to achieve attainment.

The general conformity rule applies to federal actions that are not covered by the transportation conformity rule. Other than the listed exemptions and presumptions of conformity, the general conformity rule applies to actions in which projected emissions exceed applicable conformity *de minimis* thresholds. If a projects emissions are less than *de minimis* thresholds and are 10 percent or more of a nonattainment or maintenance area's total emissions of any criteria pollutant, then the action is considered "regionally significant" and the requirements of conformity determination apply. If the Proposed Action's direct and indirect emissions are less than the established *de minimis* thresholds, and are not considered regionally significant, the project is then assumed to be in conformity, and formal reporting of the conformity determination is not required.

Emission Thresholds and Quantification

The emission threshold for determining conformity is based on the NAAQS attainment standard for Santa Barbara County. Santa Barbara County is in attainment or unclassifiable for the NAAQS for carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), particulate matter 10 microns or less diameter (PM_{10}), and sulfur dioxide (SO_2), and is in serious nonattainment for NAAQS for ozone (O_3). The serious nonattainment status and corresponding threshold for O_3 will be used to determine general conformity. U.S. EPA threshold limits used to determine general conformity are listed in Table F-11

Emission quantification is defined as the sum of all direct and indirect criteria pollutants and precursor emissions, including stationary and mobile emission sources. Timing and location rather than the type of emission source distinguishes direct and indirect emissions. Direct emissions occur at the same time and place as the federal action. Indirect emissions include those that may occur later or at a distance from the federal action. General conformity limits the scope of indirect emissions to those that can be quantified and are reasonably foreseeable by the federal agency at the time of analysis, and those for which the federal agency can practicably control and will maintain control through its continuing program responsibility.

Table F-11. U.S. EPA Threshold Limits Used to Determine General Conformity.

CRITERIA POLLUTANT ATTAINMENT STATUS	THRESHOLD LEVEL (TONS/YR)
Ozone (Volatile Organic compound [VOC] or NO_x)	
Serious	50
Severe	25
Extreme	10
Other ozone non-attainment areas (NAA) outside of ozone transport region	100
Marginal and moderate NAA's inside an ozone transport region:	
VOC	50
NO_x	100
CO - All nonattainment areas:	100
PM_{10}	
Moderate	100
Serious	70
SO_2 or NO_2 - All nonattainment areas	100
Pb - All nonattainment areas	25

Source: 40 CFR 93.153(b).

Emissions Summary

As part of this conformity determination, the project emissions were compared with the Santa Barbara County's emissions. The latest, approved emission inventory is the 1999 Annual Emission Inventory, as found in the 2001 Clean Air Plan. Because Outer Continental Shelf (OCS) sources are now part of Santa Barbara County Air Pollution Control District (APCD) jurisdiction and contribute to air quality impacts in Santa Barbara County, OCS emission sources are included in the total emissions. Both inventories and the emission amounts that qualify as regional significant are presented in Table F-12. In Santa Barbara County, the term Reactive Organic Compounds (ROC) is used to describe that portion of VOC that readily react in the atmosphere and produce ozone. The definition of ROC found in APCD Rule 102 is identical to the U.S. EPA definition of VOC. They are used synonymously in this analysis.

Table F-12. 1999 Santa Barbara County (SBC) Annual Emission Inventory.

SOURCE	ANNUAL EMISSIONS (TONS/YEAR)	
	NO_X	ROC
Santa Barbara County		
- Stationary Sources	2,001.46	3,051.82
- Area-Wide Sources	551.05	3,270.75
- Mobile Sources	15,316.54	9,351.65
Outer Continental Shelf		
- Stationary Sources	254.99	377.24
- Mobile Sources	10,356.26	651.23
Total SBC	***28,480.30***	***16,702.69***
Regional Significant Emissions	***2,848.03***	***1,670.27***

SOURCE: 2001 Santa Barbara County APCD Clean Air Plan

Proposed Action Emissions and Conformity Determination

Due to the serious non-attainment status of Santa Barbara County, the corresponding threshold of 50 tons per year for O_3 is used to determine general conformity. Table F-13shows a comparison of the estimated annual project emissions with threshold and with regional significant emission levels.

Table F-13. Proposed Action Emissions at Vandenberg AFB.

Source	Annual Emissions (Tons/Year)		Exceeds Threshold or Regional Significant
	NO_x	ROC	
Project Emissions	17.37	4.74	No
De minimis Thresholds	50.00	50.00	
Regional Significant Emission Levels	2,848.03	1,670.27	

The total direct and indirect emissions from the emergency repair, temporary shoring, and proposed retrofit of the 13th Street Bridge do not exceed Federal *de minimis* conformity threshold values for O_3 precursors (NO_x and VOCs). In addition, total emissions of NO_x and VOCs from the Proposed Action are less than 10 percent of the latest approved Annual Emission Inventory for Santa Barbara County (2001 Santa Barbara County APCD Clean Air Plan). The Proposed Action is therefore deemed *de minimis* and not regionally significant and is exempt from further conformity requirements. This determination is in accordance with conformity requirements set for the in 40 CFR 93.153 (b), (c), and section 176 (c) (4) of the Clean Air Act.